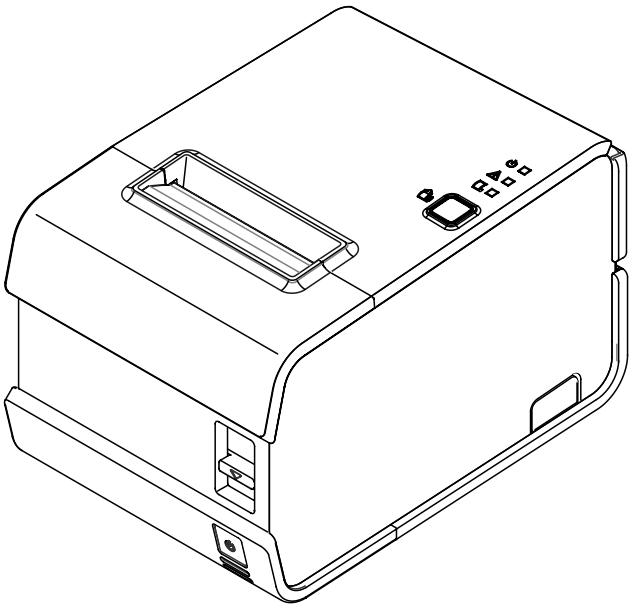
SERVICE MANUAL

POS PRINTER
ELLIX 20



All specifications are subject to change without notice.

REVISION RECORD

Edition	Date published	Revised contents
V1.0	October, 2005	First release

The contents of this manual are subject to change without prior notice.

PREFACE

This service manual provides the technical information for many individual component systems, circuits and gives an analysis of the operations performed by the circuits. If you need more technical information, please contact Technical Support. Schematics and specifications provide the needed information for the accurate troubleshooting.

All information in this manual is subject to change without prior notice. Therefore, you must check the correspondence of your manual with your machine. No part of this manual may be copied or reproduced in any form or by any means, without the prior written consent of Shin Heung Precision Co., Ltd.

ALERT MESSAGE & SYMBOL

This manual uses the following conventions to show the alert messages. An alert message consists of an alert signal and alert statements. The alert signal consists of an alert symbol and a signal word or just a signal word. The following are the alert signals and their meanings:

⚠DANGER

This indicates a hazardous situation *likely* to result in *serious personal injury* if the user does not perform the procedure correctly.

⚠WARNING

This indicates a hazardous situation *could* result in *personal injury* if the user does not perform the procedure correctly.

⚠CAUTION

This indicates a hazardous situation *could* result in *minor or moderate personal injury* if the user does not perform the procedure correctly. This alert signal also indicates that damages to the product or other property, *may* occur if the user does not perform the procedure correctly.

IMPORTANT

This indicates information that could help the user use the product more efficiently.

CONTENTS

CHAPTER 1 PRECAUTION STATEMENT 1-1

1.1 Safety Precaution 1-2

1.2 Servicing Precaution 1-3

1.3 Precaution for Electrostatic Sensitive Device 1-4

1.4 Operational Precaution 1-4

CHAPTER 2 PRODUCT SPECIFICATION 2-1

2.1 General Specification 2-2

2.2 Appearance 2-3

2.2.1 Printer Dimension 2-3

2.2.2 AC Adapter Dimension 2-3

2.2.3 Feature Location 2-4

2.3 Thermal Printer Specification 2-4

2.3.1 Printer Specification 2-4

2.3.2 Character Specification 2-5

2.3.3 Paper Specification 2-5

2.3.4 Reliability and Environment Specification 2-5

2.3.5 Printable Area 2-6

2.3.6 TPH Specification 2-7

2.3.7 TPH Maximum Condition 2-7

2.3.8 Other Component Specification 2-7

2.4 SMPS Specification 2-8

2.4.1 SMPS Specification 2-8

2.4.2 SMPS Output Connector 2-8

2.5 Interface Specification 2-9

2.5.1 RS-232C Serial Interface 2-9

2.5.1.1 RS-232C Specification 2-9

2.5.1.2 RS-232C Signal Description 2-9

2.5.1.3 RS-232C Interface Cable 2-10

2.5.2 RS-485 Serial Interface 2-11

2.5.2.1 RS-485 Signal Description 2-11

2.5.2.2 RS-485 Interface Cable 2-11

2.5.3 IEEE-1284 Parallel Interface 2-12
2.5.3.1 Parallel Interface Cable Pin Connection 2-12
2.5.3.2 Parallel Signal Description 2-12
2.5.4 USB Interface 2-14
2.5.4.1 USB Specification 2-14
2.5.4.2 USB Signal Description 2-14
2.5.4.3 USB Interface Cable 2-14
2.5.5 Ethernet Interface 2-15
2.5.5.1 Ethernet Specification 2-15
2.5.5.2 Ethernet Interface Cable 2-15
2.6 Drawer Kick-Out Specification 2-16
2.6.1 Drawer Signal Description 2-16
2.6.2 Drawer Interface Cable 2-16

CHAPTER 3 INSTALLATION AND OPERATION 3-1
3.1 Installation 3-2
3.1.1 AC Adapter, Interface and Drawer Cable Installation 3-2
3.1.2 Paper Roll Installation 3-4
3.1.3 Partition Installation 3-5
3.1.4 Wall Mount Installation 3-6
3.2 Operation 3-7
3.2.1 Setting the DIP Switch 3-7
3.2.1.1 DIP Switch Setting 1 Function 3-7
3.2.1.2 Baud Rate Selection 3-8
3.2.1.3 DIP Switch Setting 2 Function 3-8
3.2.1.4 Printing Density Selection 3-8
3.2.2 Hexadecimal Dumping 3-9
3.2.3 The Self Test Mode 3-10
3.2.4 Control Command 3-12

CHAPTER 4 DISASSEMBLY AND ASSEMBLY 4-1
4.1 Case-Lower Block 4-2
4.2 Case-Upper Block 4-4
4.3 Printer Block 4-7

CHAPTER 5 MAINTENANCE AND ADJUSTMENT 5-1
5.1 Adjustment 5-2
5.1.1 Adjustment Near-End Sensor 5-2
5.1.2 Paper Jam 5-4
5.2 Maintenance 5-5
5.2.1 Cleaning Head 5-5

CHAPTER 6 REFERENCE INFORMATION 6-1
6.1 SDRAM (K4S641632A) Diagram & Description 6-2
6.2 NOR FLASH MEMORY (A29L800UV) Diagram & Description 6-3
6.3 MOTOR DRIVER IC (MC34920EI) Diagram & Description 6-4
6.4 USB TO SERIAL IC (CY7C64013) Diagram & Description 6-5
6.5 Other ICs (SN74ACT245 / SN74LV14 / LM393D) Diagram & Description 6-6
6.6 Other ICs (74HC74 / 34063 / MAX232) Diagram & Description 6-7
6.7 Other ICs and TR, DIODE Diagram 6-8

CHAPTER 7 TROUBLESHOOTING 7-1
7.1 Power Problem 7-2
7.1.1 Verifying the Power Supply 7-2
7.1.2 Verifying the Main B'D Power Line 7-3
7.1.3 Verifying the LED B'D Power Line 7-4
7.1.4 Verifying the TPH Logic Power Line 7-4
7.1.5 Verifying the I/F B'D Power Line 7-4
7.2 System Problem 7-5
7.2.1 System Clock problem 7-5
7.2.2 System Signal problem 7-5
7.3 Thermal Printer and Feed Motor problem 7-6
7.3.1 TPH problem 7-6
7.3.2 Step Motor and Auto Cutter problem 7-7
7.4 LED B'D and Sensor Problem 7-8
7.5 Drawer Problem 7-9
7.6 RS-232C Interface Problem 7-9
7.7 RS-485 Interface Problem 7-10
7.8 IEEE-1284 Parallel Interface Problem 7-11
7.9 USB Interface Problem 7-12
7.10 Ethernet Interface problem 7-13

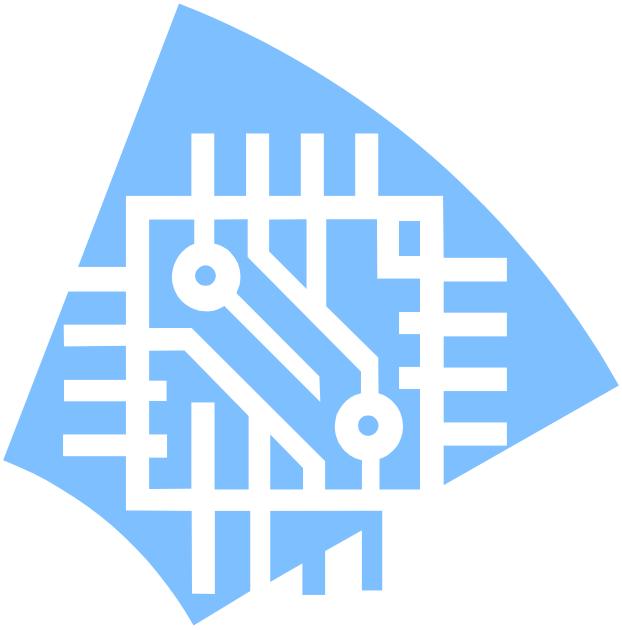
CHAPTER 8 EXPLODED VIEWS AND PARTS LIST 8-1
8.1 Exploded View 8-2
8.2 Parts List 8-3

CHAPTER 9 PCB LAYOUT AND PARTS LIST 9-1
9.1 Main PCB 9-2
9.1.1 Layout 9-2
9.1.2 Parts List 9-3
9.2 LED PCB 9-6
9.2.1 Layout 9-6
9.2.2 Parts List 9-6
9.3 P-END PCB 9-7
9.3.1 Layout 9-7
9.3.2 Parts List 9-7
9.4 P-NEAR END PCB 9-7
9.4.1 Layout 9-7
9.4.2 Parts List 9-7
9.5 POWER PCB 9-8
9.5.1 Layout 9-8
9.5.2 Parts List 9-8
9.6 RS-232C Serial Interface PCB 9-9
9.6.1 Layout 9-9
9.6.2 Parts List 9-9
9.7 RS-485 Serial Interface PCB 9-10
9.7.1 Layout 9-10
9.7.2 Parts List 9-10
9.8 IEEE-1284 Parallel Interface PCB 9-11
9.8.1 Layout 9-11
9.8.2 Parts List 9-11
9.9 USB Interface PCB 9-12
9.9.1 Layout 9-12
9.9.2 Parts List 9-12
9.10 Ethernet PCB 9-13
9.10.1 Layout 9-13
9.10.2 Parts List 9-13

CHAPTER 10 BLOCK DIAGRAM 10-1
10.1 ELLIX 20 10-2

CHAPTER 11 WIRING DIAGRAM 11-1
11.1 Main PCB Block Diagram 11-2
11.2 Main PCB Wiring Connection 11-2
11.3 LED PCB Block Diagram 11-4
11.4 LED PCB Wiring Connection 11-4
11.5 POWER PCB Block Diagram 11-6
11.6 POWER PCB Wiring Connection 11-6

CHAPTER 12 SCHEMATIC DIAGRAM 12-1
12.1 Main PCB CPU Part 12-2
12.2 Main PCB Memory Part 12-3
12.3 Main PCB Motor Driver Part 12-4
12.4 Main PCB TPH Part 12-5
12.5 Main PCB Sensing Part 12-6
12.6 Main PCB Drawer / Buzzer / Reset Part 12-7
12.7 Main PCB Power Part 12-8
12.8 Main PCB Interface Part 12-9
12.9 LED PCB Circuit 12-10
12.10 Power PCB Circuit 12-11
12.11 Paper End PCB Circuit 12-12
12.12 RS-232C I/F PCB Circuit 12-13
12.13 RS-485 I/F PCB Circuit 12-14
12.14 IEEE-1284 Parallel I/F PCB Circuit 12-15
12.15 USB I/F PCB Circuit 12-16
12.16 Ethernet I/F PCB Circuit 12-17



Chapter 1

Precaution Statement

1.1 Safety Precaution
1.2 Servicing Precaution
1.3 Precaution for Electrostatic Sensitive Device
1.4 Operational Precaution

Follow these safety, servicing and ESD precautions to prevent damage and to protect against potential hazards such as electrical shock

1.1 Safety Precaution

1-1-1 Be sure that all built-in protective devices are replaced. Restore any missing protective shields.

1-1-2 When reinstalling the chassis and its assemblies, be sure to restore all protective devices, including nonmetallic control knobs and compartment covers.

1-1-3 Make sure there are no cabinet openings through which people - particularly children - might insert fingers and contact dangerous voltages. Such openings include excessively wide cabinet ventilation slots and improperly fitted covers and drawers.

1-1-4 Design Alteration Warning:

Never alter or add to the mechanical or electrical design of the SECR. Unauthorized alterations might create a safety hazard. Also, any design changes or additions will void the manufacturer's warranty.

1-1-5 Components, parts and wiring that appear to have overheated or that are otherwise damaged should be replaced with parts that meet the original specifications. Always determine the cause of damage or over heating, and correct any potential hazards.

1-1-6 Observe the original lead dress, especially near the following areas; sharp edges, and especially the AC and high voltage supplies. Always inspect for pinched, out-of-place, or frayed wiring. Do not change the spacing between components and the printed circuit board. Check the AC power cord for damage. Make sure that leads and components do not touch thermally hot parts.

1-1-7 Product Safety Notice:

Some electrical and mechanical parts have special safety-related characteristics which might not be obvious from visual inspection. These safety features and the protection they give might be lost if the replacement component differs from the original - even if the replacement is rated for higher voltage, wattage, etc.

Components that are critical for safety are indicated in the circuit diagram by shading, (⚠) or (⚠). Use replacement components that have the same ratings, especially for flame resistance and dielectric strength specifications. A replacement part that does not have the same safety characteristics as the original might create shock, fire or other hazards.

⚠WARNING

Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose used batteries according to the manufacturer's instructions.

1.2 Servicing Precaution

1-2-1 Servicing precautions are printed on the cabinet. Follow them

1-2-2 Always unplug the units AC power cord from the AC power source before attempting to:

(a) Remove or reinstall any component or assembly.

(b) Disconnect an electrical plug or connector.

(c) Connect a test component in parallel with an electrolytic capacitor.

1-2-3 Some components are raised above the printed circuit board for safety. An insulation tube or tape is sometimes used. The internal wiring is sometimes clamped to prevent contact with thermally hot components. Reinstall all such elements to their original position.

1-2-4 After servicing, always check that the screws, components and wiring have been correctly reinstalled. Make sure that the portion around the serviced part has not been damaged.

1-2-5 Check the insulation between the blades of the AC plug and accessible conductive part.

(Example: metal panels and input terminals).

1-2-6 Insulation Checking Procedure:

Disconnect the power cord from the AC source and turn the power switch ON. Connect an insulation resistance meter (500V) to the blades of AC plug.

The insulation resistances between each blade of the AC plug and accessible conductive parts (see above) should be greater than 1 Mega-ohm.

1-2-7 Never defeat any of the B+ voltage interlocks. Do not apply AC power to the unit (or any of its assemblies) unless all solid-state heat sinks are correctly installed.

1-2-8 Always connect an instrument's ground lead to the instrument chassis ground before connecting the positive lead; always remove the instrument's ground lead last.

⚠WARNING

An electrolytic capacitor installed with the wrong polarity might explode.

⚠CAUTION

First read the-Safety Precautions-section of this manual. If some unforeseen circumstance creates a conflict between the servicing and safety precautions, always follow the safety precautions.

1.3 Precaution for Electrostatic Sensitive Device

1-3-1 Some semiconductor (solid state) devices are easily damaged by static electricity. Such components are called Electrostatic Sensitive Devices (ESDs); examples include integrated circuits and some field-effect transistors. The following techniques will reduce the occurrence of component damage caused by static electricity.

1-3-2 Immediately before handling any semiconductor components or assemblies, drain the electrostatic charge from your body by touching a known earth ground. Alternatively, wear a discharging wrist-strap device. (Be sure to remove it prior to applying power - this is an electric shock precaution)

1-3-3 After removing an ESD-equipped assembly, place it on a conductive surface such as aluminum foil to prevent accumulation of electrostatic charge.

1-3-4 Do not use Freon-propelled chemicals. These can generate electrical charges that damage ESDs.

1-3-5 Use only a grounded-tip soldering iron when soldering or unsoldering ESDs.

1-3-6 Use only an anti-static solder removal device. Many solder removal devices are not rated as anti-static; these can accumulate sufficient electrical charge to damage ESDs.

1-3-7 Do not remove a replacement ESD from its protective package until you are ready to install it. Most replacement ESDs are packaged with leads that are electrically shorted together by conductive foam, aluminum foil or other conductive materials.

1-3-8 Immediately before removing the protective material from the leads of a replacement ESD, touch the protective material to the chassis or circuit assembly into which the device will be installed.

1-3-9 Minimize body motions when handling unpackaged replacement ESDs. Motions such as brushing clothes together or lifting a foot from a carpeted floor can generate enough static electricity to damage an ESD.

1.4 Operational Precaution

1-4-1 The hitting element of the printer mechanism's thermal head and the driver IC are easily damage. Never allow these components to come into contact with metal or other hard objects.

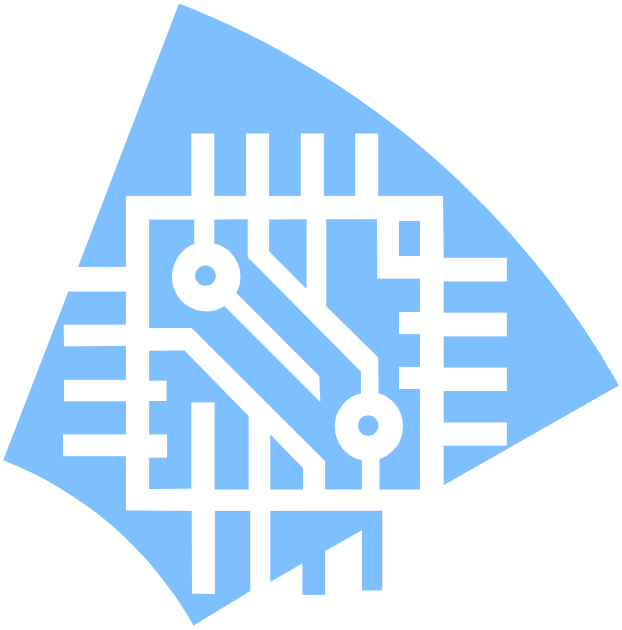
1-4-2 Never touch the printer mechanism's heating element with your hand. Doing so can damage the heating element and affect proper operation.

1-4-3 The head and motor areas are very hot during and immediately after printing. Do not touch components in these areas directly with your hand.

1-4-4 Do not use any paper other than these specified in this manual, otherwise print head reliability and print quality are affected adversely.

1-4-5 Thermal paper starts to color at around 70℃. Take care to protect unused and printed thermal paper against the affects of heat, light and humidity, which can cause the paper to color and characters on the paper to feed.

1-4-6 Take the roll paper out of the printer when you will not use the printer for a long time in a high temperature and humidity environment.



Chapter 2

Product Specification

2.1 General Specification
2.2 Appearance
2.3 Thermal Printer Specification
2.4 SMPS Specification
2.5 Interface Specification
2.6 Drawer Kick-Out Specification

2.1 General Specification

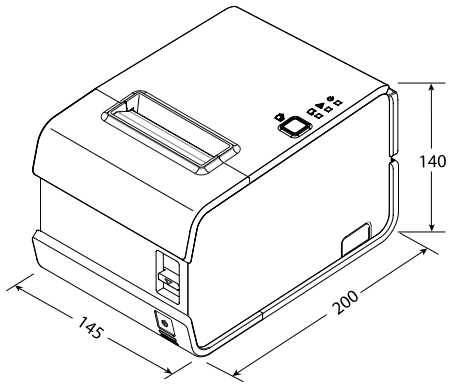
Item	Description	Remark
Processor	• SAMSUNG S3C44B0X • Cache Memory Size : 8K Byte	
Memory	• SDRAM : 64Mbits (K4S641632A) • FLASH ROM : 8Mbits (A29L800UV)	
Interface Serial (RS-232C / RS-485)	• Flow Control : ① DTR / DSR (H/W Flow Control) ② XON / XOFF (S/W Flow Control) • Baud Rate : 2400 / 4800 / 9600 / 14400 / 19200 / 38400 / 57600 / 115200 bps • Receive Buffer : 4 Kbytes • Connector : DB25P Female (I/F PBA Side)	The Flow Control, Baud Rate, Stop Bit and Parity Are determined by DIP S/W position.
Interface Parallel	• Mode ① Forward Mode : Compatibility Mode ② Reverse Mode : Nibble / Byte Mode • Connector : 36 Pin Centronics (Ribbon Type)	
USB	• Transfer Type : BULK • Speed : 12 Mbps (Full-Speed) • Power : Self-Powered	
Ethernet	• Network Interface : Static and Dynamic IP Address • Speed : 10 Mbps	
Auto Cutter	• Type : Guillotine • Cutting Method : 1 Point Partial Cutting	
Power Consumption	• Approx. 27W (Peak)	
AC Adapter	• Input : AC 90V ~ 264V, 50Hz ~ 60Hz • Output : DC 24V, 2.5A	
Environmental Temperature	• Operation : 5℃ ~ 45℃ • Storage : -10 ~ 50℃	
Humidity	• Operation : 10% ~ 90% RH • Storage : 10% ~ 90% RH (Except for Paper)	

2.1 General Specification

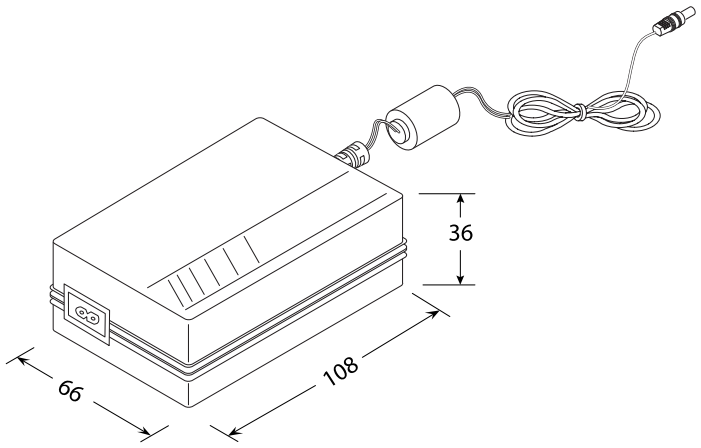
Item	Description	Remark
Option	• Wall Mount Kit • Paper Seperater (58mm) • Kitchen Bell • Cabinet Color : Dark Gray	
Weight	• 1.7 Kg (Only Set) / 2.9 Kg (With Packing)	
Dimensions(mm)	• 145(W) × 200(D) × 140(H)	

2.2 Appearance

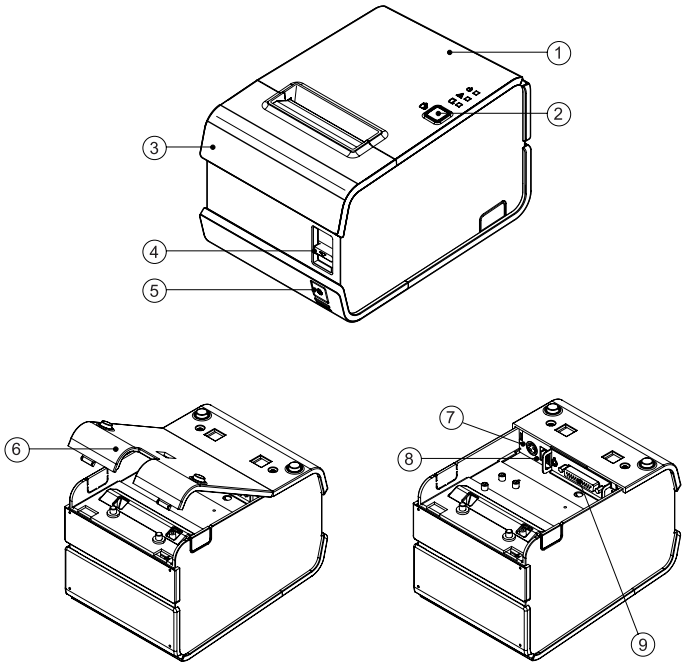
2.2.1 Printer Dimension (mm)



2.2.2 AC Adapter Dimension (mm)



2.2.3 Feature Location



① Cover Open	⑥ POWER JACK
② Feed Button	⑦ Drawer Connector
③ Cover Cutter	⑧ Interface Port
④ Open Button	⑨ Serial Port
⑤ Power Button	-

2.3 Thermal Printer Specification

2.3.1 Printer Specification

Item	Description	Remark
Model	• ELLIX 20	SAM4S
Print Method	• Thermal Line Printing	
Dot Density	• 0.141 mm (7.09 Dots/mm)	
Printing Direction	• Unidirectional with friction feed	
Paper Width	• Max. 80.0mm / 58.0mm	
Printing Width	• Mono Paper 80mm : 72.192mm (512 Dots Position) • Mono Paper 58mm : 50.76mm (360 Dots Position)	
Character / Line	• Font A (12×24) : 42(80mm) / 30(58mm) • Font B (9×17) : 56(80mm) / 40(58mm)	
Character Spacing	• 0.28mm (0.01”) (2 dots) (Font A) • 0.28mm (0.01”) (2 dots) (Font B)	
Printing Speed	• Mono Paper 80mm : Max. 220 mm/sec (52 ines/Sec) • Mono Paper 58mm : Max. 150 mm/sec (35.5 ines/Sec) • Two Color Paper : Max. 100 mm/sec (23.6 ines/Sec)	
Paper feeding Speed	• Approx. 220 mm/Sec (Mono Paper 80mm)	

2.3.2 Character Specification

Item	Description	Remark
Number of Character	• Alphanumeric Characters : 95	
	• Extended Characters : 128 × 11 Page (Including one space page)	
	• International Characters : 37	
Character Structure	• 12 × 24 (Font A) (Including 2-dot spacing in horizontal) • 9 × 17 (Font B) (Including 2-dot spacing in horizontal) Font A is selected as the default	

2.3.3 Paper Specification

Item	Description	Remark
Paper Type	• Mitsubishi F5841	
Paper Form	• Paper Roll	
Paper Width	• Max 58.0 / 80.0 mm	
Paper Roll Size	• Max Φ83 mm	
Spool Inside Dia.	• 12 mm (0.47”)	
Spool Outside Dia.	• 18 mm (0.71”)	

IMPORTANT

The Following paper can be used instead of the specified paper above.

- TF50KS-E : Nippon Paper industries Co., Ltd.

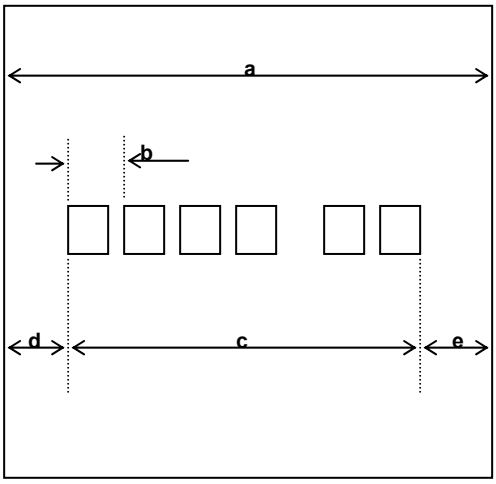
2.3.4 Reliability and Environment Specification

Item	Description	Remark
Life	• Head : 1×10^{8} Pulses / 100Km • Auto Cutter : 1,500,000 Cut	
MCBF	• 70,000,000 Line	
Environmental Temperature	• Operating : 5℃ ~ 45℃ • Storage : -10℃ ~ +50℃	
Humidity	• Operating : 10% ~ 90% RH • Storage : 10% ~ 90% RH (Except for Paper)	

2.3.5 Printable Area

[80mm Paper Width Model]

The Printable area of a paper with width of 79.5 mm is 72.192 mm (512 Dots) and the space on the right and left sides are approximately 3.6 mm.



a = 79.5 mm ±0.5 mm (Paper Width)

b = 0.141mm (1 Dot)

c = 72.192mm (512 Dots/Printable Area)

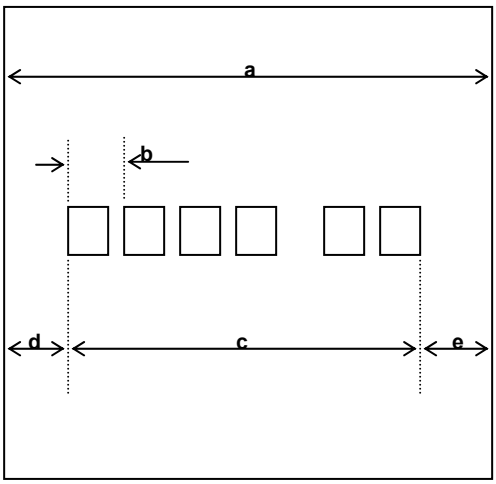
d = 3.6mm (Left Space)

e = 3.6mm (Right Space)

[All the numeric values are typical]

[58mm Paper Width Model]

The Printable area of a paper with width of 57.5 mm is 50.76 mm (360 Dots) and the space on the right and left sides are approximately 3.14 and 3.6 mm.



a = 57.5 mm ±0.5 mm (Paper Width)

b = 0.141mm (1 Dot)

c = 50.76mm (360 Dots/Printable Area)

d = 3.6mm (Left Space)

e = 3.14mm (Right Space)

[All the numeric values are typical]

2.3.6 TPH(Thermal Printer Head) Specification

Item	Description	Remark
Heat Element Structure	• 2 Heaters / Dot	
Number of Heat Element	• 512 Dots	
Heat Element Pitch	• 0.141 mm/dot, 7.09 Dot/mm (180DPI)	
Print Width	• 72.192 mm	
Average Resistance	• 650Ω ± 3%	
Thermister	• Resistance R25 : 30 kΩ ± 5% (At 25℃) • B Value : 3950 K± 2% • Temperature : -20℃ ~ +80℃	

2.3.7 TPH(Thermal Printer Head) Maximum Condition : At 25℃

Item	Maximum Conditions	Unit	Conditions
Print Cycle(S.L.T.)	0.64	ms/Line	Tsub = 25℃
Supply Energy	0.233	mJ/Dot	
Supply Voltage	26.4	V	Vp < 28.0V (Vp : Peak of VH)
Substrate Temperature	65	℃	Thermister Temperature
Number of Dots to be Energized simultaneously	512	Dots	
Logic Supply Voltage (Vdd)	7	V	Include Peak Voltage of Vdd
Logic Input Voltage (Vin)	-0.5 ~ Vdd+0.5	V	

2.3.8 Other Component Specification

Item	Description	Remark
Auto Cutter	• Model : ORC-RWB80-2 • Type : Guillotine Type • Motor : DC Brush Motor FK-130SH-09450 • Voltage : 24V DC ± 7 % • Current : 800mA (Average), 1.6A(Peak)	OHYANE RIKI MFG, Co.,Ltd Mabuchi Motor
Paper Feed Motor	• Model : PM42L-048-YKE5 • Type : 2-2Phase • Voltage : 24V ± 10% DC • Resistance : 20Ω at 25℃ per Phase	PM Type Bi-Polar Driver
Paper End Sensor	• Reflection Type Photo Sensor	
Paper Roll Near End Sensor	• Micro SW TYPE	

2.4 SMPS Specification

2.4.1 SMPS(Switching Mode Power Supply) Specification

Item	Description	Remark
Input Voltage	• Typical : 120V / 230V AC • Min : 90V AC • Max : 264V AC	
Input Current	• Max : 1.5 A(When 120V), 0.75A(When 230V)	
In rush Current	• Max : 40 A (Peak to Peak)	
Line Regulation	• +24V ± 1 %	
Load Regulation	• +24V ± 5 %	
Ripple Noise	• Peak 300mV	
O.C.P (Over Current Protect)	• 3.0 A ~ 6.0 A	
S.C.P (Short Current Protect)	• Fold-Back Method	

2.4.2 SMPS Output Connector

Pin Number	Signal Name
1	DC +24V
2	GND
3	N.C
Shield	Frame GND

2.5 Interface Specification

2.5.1 RS-232C Serial Interface

2.5.1.1 RS-232C Specification

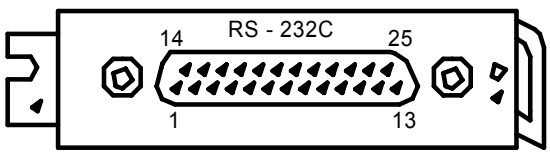
Item	Description	Remark
Data Transmission	• Serial	
Synchronization	• Asynchronous	
Hand Shaking (Flow Control)	• H/W : DTR / DSR • S/W : XON / XOFF	XON : ASC Code 11h XOFF : ASC Code 13h
Signal Level	• Logic"1" (MARK) : -3V ~ -15V • Logic"0" (SPACE) : +3V ~ +15V	
Baud Rate	• 2400 / 4800 / 9600 / 14400 / 19200 / 38400 / 57600 / 115200 bps	Default 115200 bps
Data Word Length	• 7 Bit / 8 Bit	
Parity	• None / Even / Odd	
Connector	• DB25P Female (I/F PBA)	

IMPORTANT

The Hand Shaking(Flow Control) / Baud Rate / Data Word Length / Parity functions depend on the DIP switch settings. Refer to "Chap. 3.2."

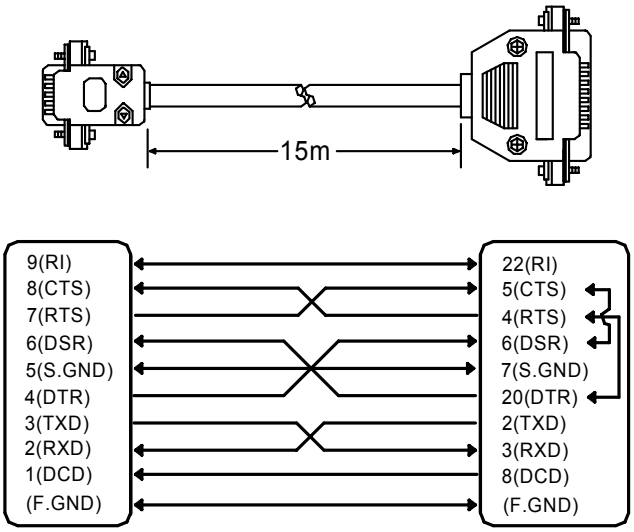
2.5.1.2 RS-232C Signal Description

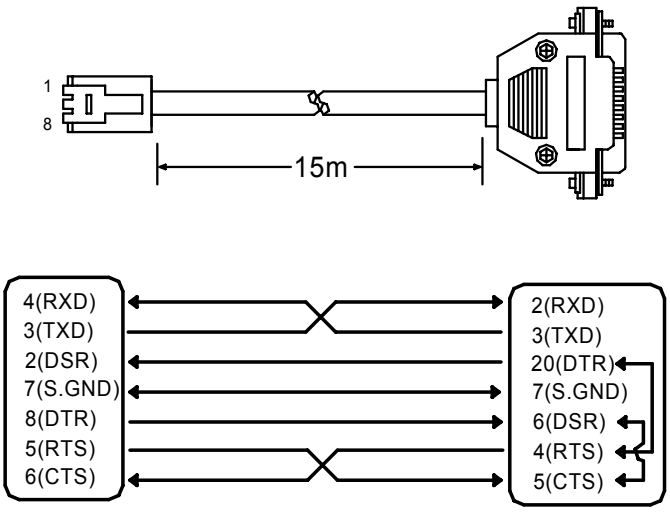
PIN NO DSUB25(Female)	Signal Name	Direction	Function
3	RXD	IN	Receive Data
2	TXD	OUT	Transmit Data
20	DTR	OUT	Data Set Ready
7	GND	-	-
6	DSR	IN	Data Terminal Ready
4	RTS	OUT	Request To Send
5	CTS	IN	Clear To Send



(EXPLODED VIEW)

2.5.1.3 RS-232C Interface Cable

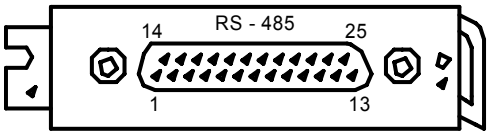
USER SIDE **(DSUB9 FEMALE)**	 **(INTERFACEF CABLE PIN CONNECTION)**	**PRINTER SIDE** **(DSUB25 MALE)**

USER SIDE **(RJ45)**	 **(INTERFACEF CABLE PIN CONNECTION)**	**PRINTER SIDE** **(DSUB25 MALE)**

2.5.2 RS-485 Serial Interface

2.5.2.1 RS-485 Signal Description

PIN NO DSUB25(Female)	Signal Name	Direction	Function
2	TXD-	OUT	Transmit Data
3	TXD+	OUT	
4	RXD-	IN	Receive Data
5	RXD+	IN	
7	GND	-	-
8	DTR-	OUT	Data Set Ready
9	DTR+	OUT	
10	DSR-	IN	Data Terminal Ready
11	DSR+	IN	

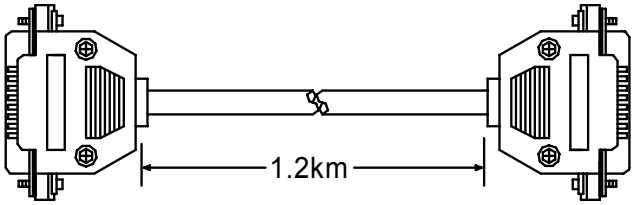


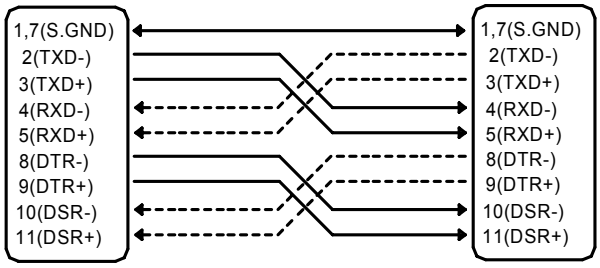
(EXPLODED VIEW)

2.5.2.2 RS-485 Interface Cable

USER SIDE

(DSUB25 FEMALE)





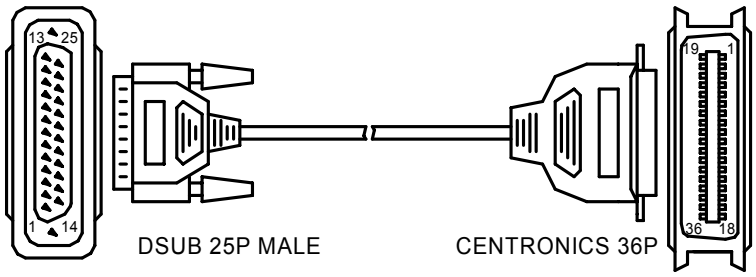
(INTERFACEF CABLE PIN CONNECTION)

PRINTER SIDE

(DSUB25 MALE)

2.5.3 IEEE-1284 Parallel Interface

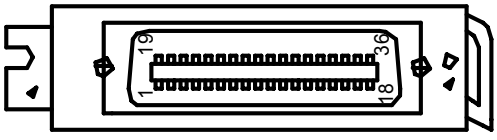
2.5.3.1 Parallel Interface Cable Pin Connection

USER SIDE (DSUB25 MALE)	 (INTERFACE CABLE PIN CONNECTION)	PRINTER SIDE

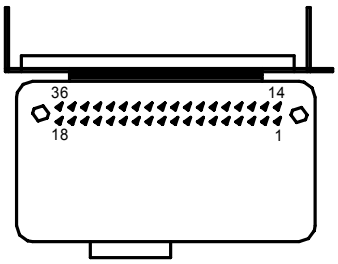
2.5.3.2 Parallel Signal Description

[IEEE-1284 DSUB 25P]

Pin No	Conn Pin Out	Pin No	Conn Pin Out	Pin No	Conn Pin Out
1	STROBE	10	ACK	19	GND
2	DATA1	11	BUSY	20	GND
3	DATA2	12	PAPER ERROR	21	GND
4	DATA3	13	AUTO FEED	22	GND
5	DATA4	14	FAULT	23	GND
6	DATA5	15	INIT	24	GND
7	DATA6	16	SERECTIN	25	GND
8	DATA7	17	GND	-	-
9	DATA8	18	GND	-	-



(EXPLODED VIEW)



(PARALLEL I/F PCB BOTTOM SIDE VIEW)

[IEEE-1284 CENTRONICS 36P]

Pin No.	Source	Compatibility Mode	Nibble Mode	Byte Mode
1	Host	nStrobe	HostClk	HostClk
2	Host / Printer	Data 0 (LSB)	-	Data 0 (LSB)
3	Host / Printer	Data 1	-	Data 1
4	Host / Printer	Data 2	-	Data 2
5	Host / Printer	Data 3	-	Data 3
6	Host / Printer	Data 4	-	Data 4
7	Host / Printer	Data 5	-	Data 5
8	Host / Printer	Data 6	-	Data 6
9	Host / Printer	Data 7 (MSB)	-	Data 7 (MSB)
10	Printer	nAck	PtrClk	PtrClk
11	Printer	Busy	PtrBusy / Data3,7	PtrBusy
12	Printer	Perror	AckDataR / Data2,6	AckDataReq
13	Printer	Select	Xflag / Data1,5	Xflag
14	Host	nAutoFd	HostBusy	HostBusy
15	-	NC	NC	NC
16	-	GND	GND	GND
17	-	FG	FG	FG
18	Printer	Logic-H	Logic-H	Logic-H
19-30	-	GND	GND	GND
31	Host	nInit	nInit	nInit
32	Printer	nFault	nDataAvail / Data0,4	nDataAvail
33	-	GND	ND	ND
34	Printer	DK_Status	ND	ND
35	Printer	+5V	ND	ND
36	Host	nSelectIn	1284-Active	1284-Active

2.5.4 USB Interface

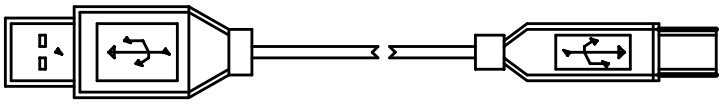
2.5.4.1 USB Specification

Item	Description	Remark
Transfer Type	● BULK	
Data Signal	● Bi-Direction, Half-Duplex ● Differential Signal Pair (D+ / D-)	
Data Format	● NRZI Format ● Zero Bit Stuffing after 6 Ones	
Transceiver	● Differential Common Mode Range : 0.8 ~ 2.5[V] ● Differential Receive Sensitivity : 200[mV] ● Single End Receive Threshold : 0.8 ~ 2.5[V]	
Speed	● 12 Mbps	
Power	● Supply Self Power	
Cable & Connector	● Cable : 5m / 2m ● Connector : B type	
Support Spec	● USB Spec Version 1.1	

2.5.4.2 USB Signal Description

Pin No	Signal Name	Color	Function
SHELL	Shield	Drain Wire	Frame GND
1	VBUS	Red	-
2	D-	White	Differential Data Line
3	D+	Green	Differential Data Line
4	GND	Black	Signal GND

2.5.4.3 USB Interface Cable

USER SIDE	 "A" TYPE PLUG "B" TYPE PLUG **(USB I/F CABLE)**	PRINTER SIDE

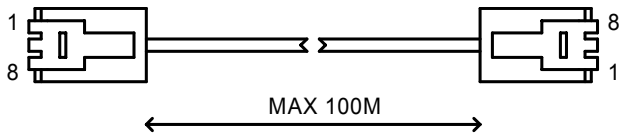
2.5.5 Ethernet Interface

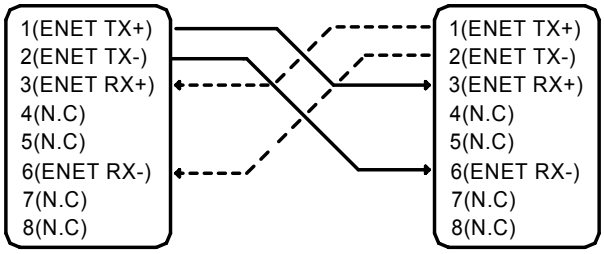
2.5.5.1 Ethernet Specification

Pin No	Signal Name	Signal Direction	Function
1	ENET TX+	OUT	Ethernet Transmit Data Line(+)
2	ENET TX-	OUT	Ethernet Transmit Data Line(-)
3	ENET RX+	IN	Ethernet Receive Data Line(+)
4	N.C	-	-
5	N.C	-	-
6	ENET RX-	IN	Ethernet Receive Data Line(+)
7	N.C	-	-
8	N.C	-	-

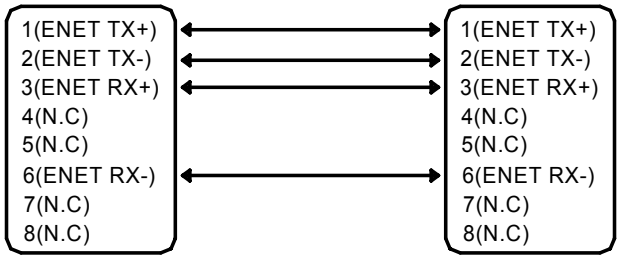
2.5.5.2 Ethernet Interface Cable

USER SIDE





(PRINTER to HOST IRC I/F CABLE)



(PRINTER to HUB IRC I/F CABLE)

PRINTER SIDE

2.6 Drawer Kick-Out Specification

2.6.1 Drawer Signal Description

Pin No	Signal Name	Direction	Function
1	S.G	-	Signal GND
2	DRAWER#1	OUT	Drawer Kick-Out Driver Signal #1
3	DRACOMP	IN	Drawer Open / Close Signal
4	+24v	-	Supply DC +24[V]
5	DRAWER#2	OUT	Drawer Kick-Out Driver Signal #2
6	F.G	-	Frame GND

⚠CAUTION

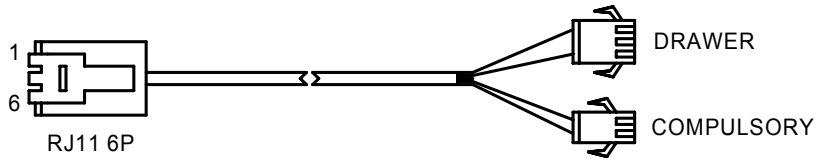
Make sure that a "+24V Cash Drawer" is used.

Make sure that the Cash Drawer Solenoid Resistance is more than 20[Ohm]

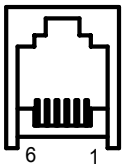
+24V is always output through "PIN4" during power on.

2.6.2 Drawer Interface Cable

PRINTER SIDE

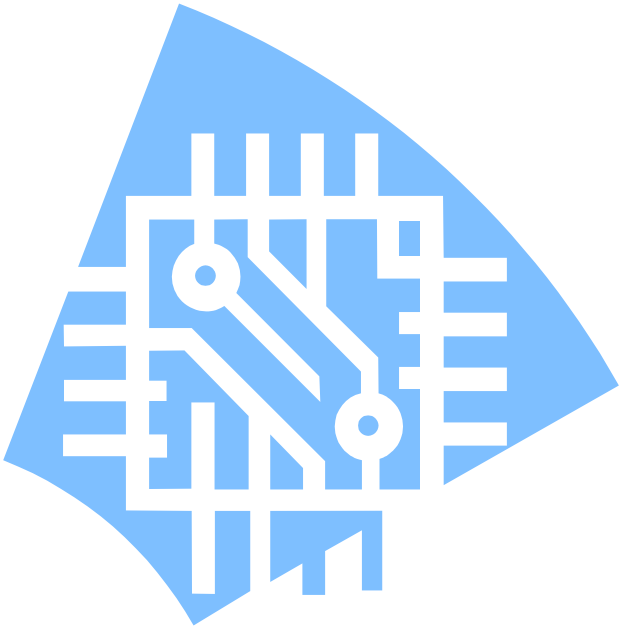


(DRAWER I/F CABLE)



(DRAWER CONNECTOR)

USER SIDE



Chapter 3

Installation and Operation

3.1 Installation
3.2 Operation

3.1 Installation

3.1.1 AC Adapter, Interface and Drawer Cable Installation

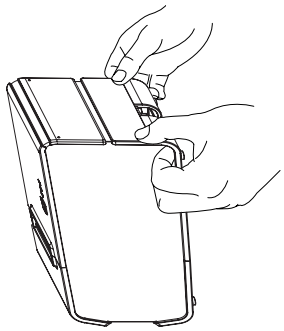


Figure 1

Figure 2

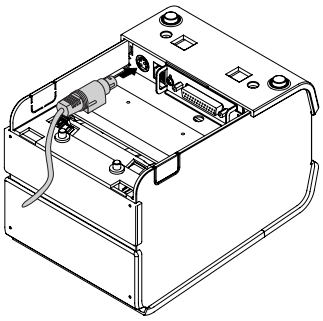


Figure 3

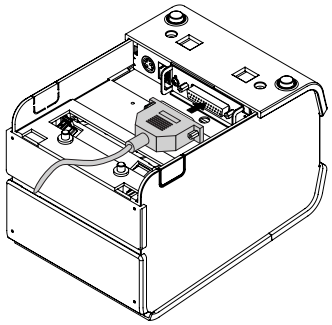


Figure 4

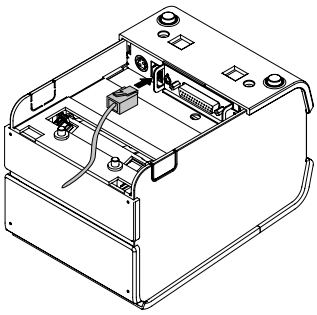


Figure 5

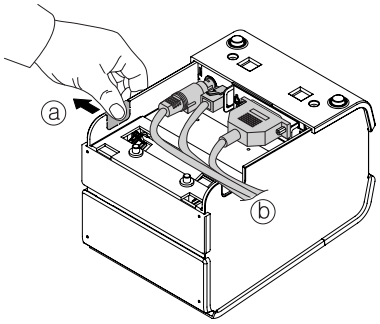


Figure 6

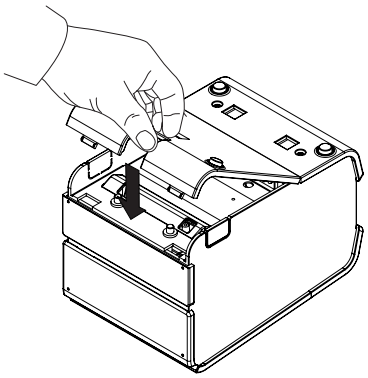


Figure 7

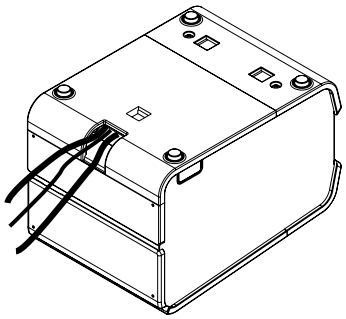


Figure 8

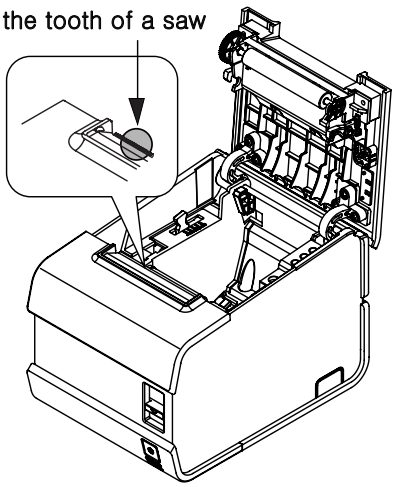
3.1.1 AC Adapter, Interface and Drawer Cable Installation - continue

1. Make sure the printer is turned off.
2. Pull the edge of the cover to separate the Cover Wire from the printer. (Fig-1,2)
3. Plug the DC cord connector into the power jack on the printer. (Fig-3)
4. If it is necessary to connect the interface, plug the interface connector into the interface port on the printer. (Fig-4)
5. If it is necessary to connect the drawer, plug the drawer connector into the drawer port on the printer.

   (Fig-5)
6. Put the two hooks into the two holes of the Case-Lower backward and close the cover until it locks firmly. (Fig-7)
7. Plug the AC Adapter power cord into the wall outlet.

⚠CAUTION

Be careful of the manual cutter.



⚠WARNING

Make sure that you use the attached Power supply or equivalent. Using an incorrect power supply may cause fire or electrical shock.

⚠CAUTION

- When connecting or disconnecting the power supply from the printer, make sure that the power supply is not plugged into an electrical outlet. Otherwise you may damage the power supply or the printer.
- If the power supply's rated voltage and your outlet's voltage do not match, contact your dealer for assistance. Do not plug in the power cord. Otherwise, you may damage the power supply or the printer.

IMPORTANT

- If you want to turn the ELLIX20 off, press and hold the power button until the POWER LED is off.
- To remove the DC cable connector, make sure that the power supply's power cord is unplugged; then grasp the connector at the arrow and pull it straight out.

3.1.2 Paper Roll Installation

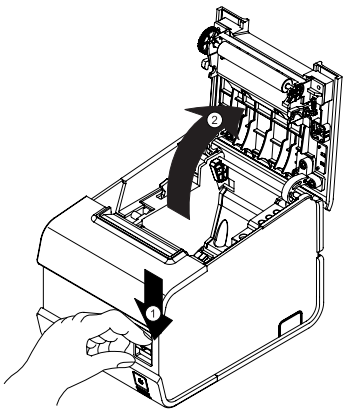


Figure 9

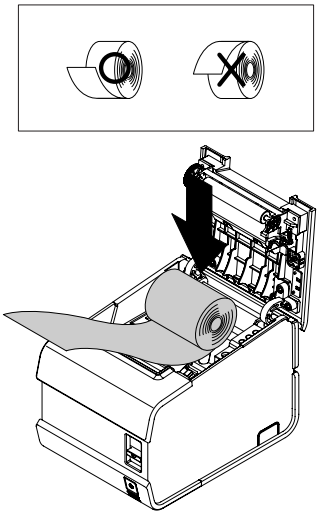


Figure 10

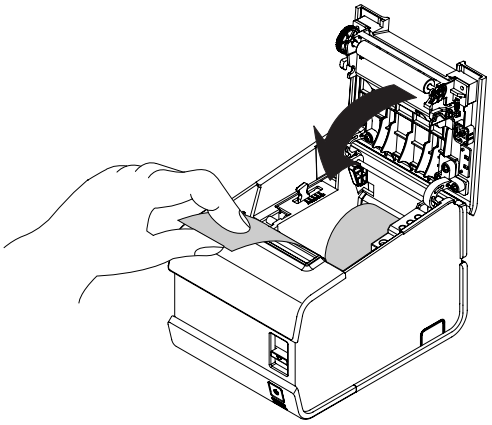


Figure 11

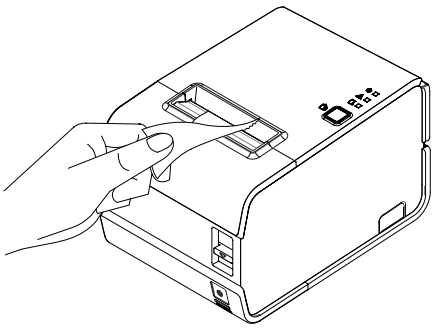


Figure 12

1. Open the paper roll cover by pressing the cover-open button. (Fig-9)
2. Remove the used paper roll core if there is one.
3. Insert the paper roll as shown. (Fig-10)
4. Be sure to note the correct direction that the paper comes off the roll.
5. Pull out a small amount of paper, as shown. Then close the cover. (Fig-11)
6. Tear off the paper as shown. (Fig-12)

IMPORTANT

Be sure to use paper rolls that meet the specifications. Do not use paper rolls that have the paper glued to the core because the printer cannot detect the paper end correctly.

3.1.3 Partition Installation

Figure 13

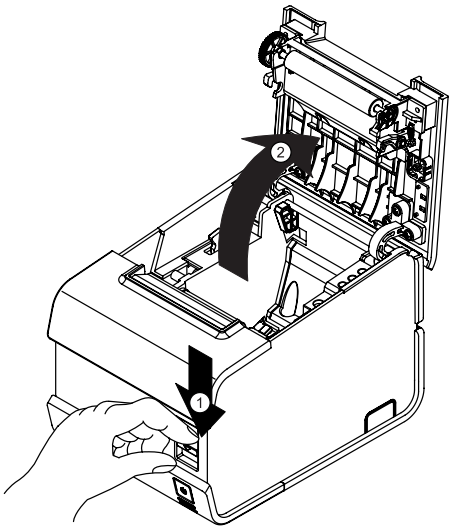
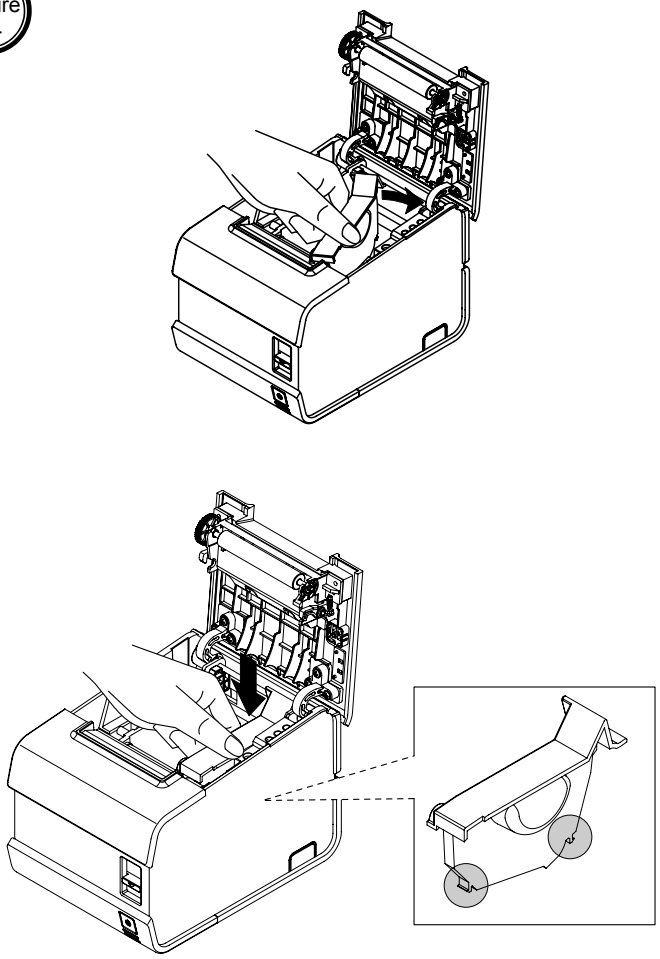


Figure 14



You can install the partition for 58mm paper printing on ELLIX20.

1. Push the Open-Button and open the cover. (Fig-13)
2. Insert the Partition into the Paper-Supply as shown. (Fig-14)
3. Push the Partition until the two hooks locks firmly. (Fig-14)

IMPORTANT

The Paper partition is dealer option item.

3.1.4 Wall Mount Installation

Figure 15

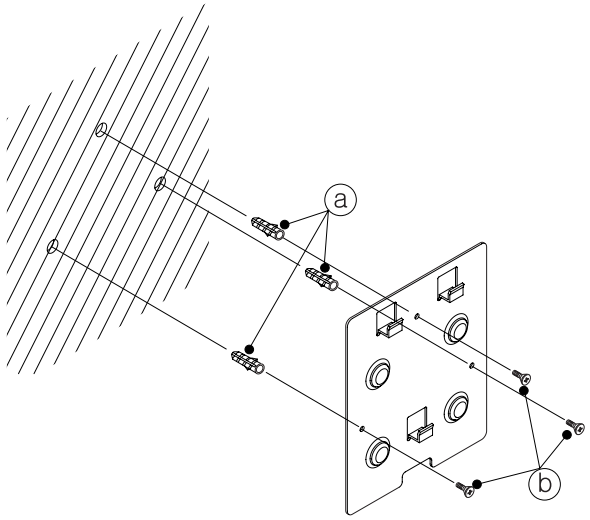
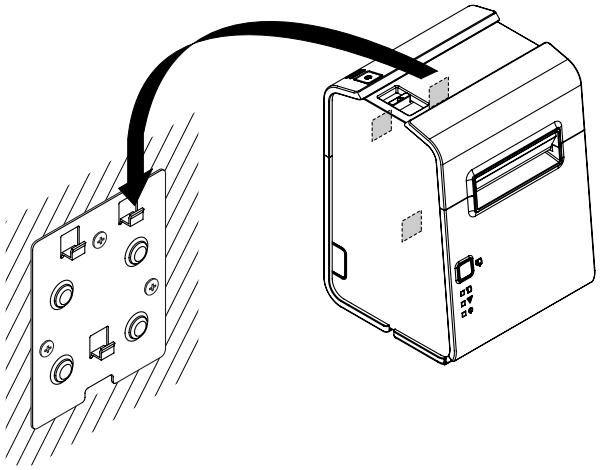


Figure 16



1. Drill the wall to make the three holes ø6.5mm, depth over 35mm and put the three anchors ⓐ into the each hole. (Notice the position of the holes.)
2. Tighten the three screws ⓑ into the each anchor to fix the BRKT-Wall to the wall as shown. (Fig-15)
3. Hang the printer on the three hooks and fix it down. (Fig-16)

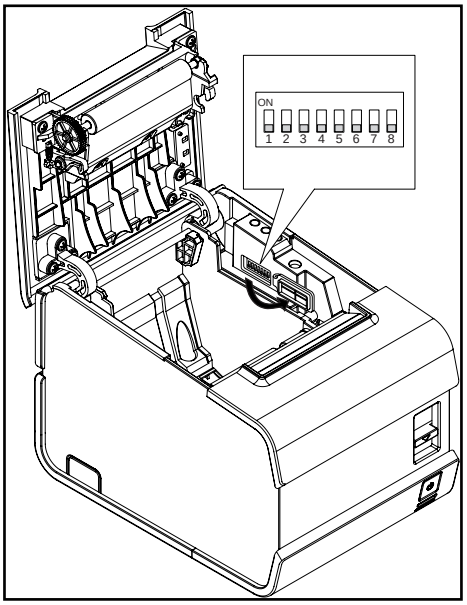
IMPORTANT

Wall mount bracket is dealer option item.

3.2 Operation

3.2.1 Setting the DIP Switch

The DIP switches are located on the inner side of the printer. The DIP switches are used to set the printer to perform various functions. Follow these steps when changing DIP switches setting:



1. Turn the power switch off.
2. Push the Open-Button and open the cover.
3. Open the DIP switch cover as shown.
4. Flip the DIP switches using tweezers or another narrow-ended tool. (Switches are on when up and off when down in the Figure.)
5. The new setting takes effect when you turn on the printer.

IMPORTANT

Always change DIP switch settings only when the printer is turned off. Change made with the power on have no effect until the powered off and then on again.

3.2.1.1 DIP Switch Setting 1 Function (When DIP SW-8 : OFF)

Switch No.	Function	ON	OFF	Default
SW-1	Handshaking	XON/XOFF	DSR/DTR	OFF
SW-2	Word Length	7 Bits	8 Bits	OFF
SW-3	Parity Check	Yes	No	OFF
SW-4	Parity Selection	EVEN	ODD	OFF
SW-5	Baud Rate Selection	Refer to the following table		OFF
SW-6				OFF
SW-7				OFF
SW-8	Memory Switch Select	Dip Switch 2	Dip Switch 1	-

3.2.1.2 Baud Rate Selection

Transmission Speed	SW-5	SW-6	SW-7	Remark
2400 Baud	ON	ON	ON	-
4800 Baud	ON	ON	OFF	-
9600 Baud	ON	OFF	ON	-
14400 Baud	ON	OFF	OFF	-
19200 Baud	OFF	ON	ON	-
38400 Baud	OFF	ON	OFF	-
57600 Baud	OFF	OFF	ON	
115200 Baud	OFF	OFF	OFF	Default

3.2.1.3 DIP Switch Setting 2 Function (When DIP SW-8 : ON)

Switch No.	Function	ON	OFF	Default
SW-1	Mode Selection	STAR	EPSON	OFF
SW-2	Kitchen Bell (Option)	Enable	Disable	OFF
SW-3	Auto Cutter	Disable	Enable	OFF
SW-4	Self Test	Hexa Dump Mode	Self Test Mode	OFF
SW-5	Select Print Density	Refer to the following table		OFF
SW-6				OFF
SW-7	Data Receive Error	Ignore	Print '?'	OFF
SW-8	Dip Switch Select	Dip Switch 2	Dip Switch 1	-

3.2.1.4 Printing Density Selection

Density Level	SW-5	SW-6	Remark
1 (Light)	ON	ON	-
2	OFF	OFF	Default
3	ON	OFF	-
4 (Dark)	OFF	ON	-

3.2.2 Hexadecimal dumping

This feature allows experienced users to see exactly what data is coming to the printer. This can be useful in finding software problems. When you turn on the hexadecimal dump function, the printer prints all commands and data in hexadecimal format along with a guide section to help you find specific commands.

To use the hexadecimal dump function, follow these steps;

1. Power the printer off.
2. Make sure DIP Switch 2-4 to ON for Hexadecimal dumping mode.
3. Turn on the power while pressing the FEED button or executing **GS (A** command; then the printer prints "HEXADECIMAL DUMP MODE …" on the paper roll and enter the hexadecimal dump mode.
4. Run any software program that sends data to the printer. The printer will print all the codes it receives in a two-column format. The first column contains the hexadecimal codes and the second column gives the ASCII characters that correspond to the codes.

HEXADECIMAL DUMP MODE
PRESS PAPER FEED BUTTON THREE
TIMES TO EXIT DUMP MODE

1D	57	00	02	1D	48	02	42	61	72	. W . . . H . B a r
43	6F	64	65	20	50	72	69	6E	74	C o d e P r i n t
69	6E	67	0A	0A	1D	6B	00	31	32	i n g . . . K . 1 2

IMPORTANT

- A period (.) is printed for each code that no ASCII equivalent.
- During the hexadecimal dump all commands expect **DLE EOT** and **DLE ENQ** are disabled.

5. When the printing finishes, turn off the printer or press the FEED button three times, and then change DIP switch 2-4 to OFF (Self-Test mode).
6. Turn on the printer and then the hexadecimal mode is off.

3.2.3 The Self Test Mode

The self-test checks whether the printer has any problem. If the printer does not function properly, contact your dealer.

The self-test checks the following;

1. Make sure paper roll has been installed properly.
2. Turn on the power while holding down the FEED button. The self-test begins. (Fig-18)
3. The self-test prints the current printer status, which provides the control ROM version and the DIP switch setting.
4. After printing the current printer status, self-test printing will print the following and pause

   (The PAPER LED light blinks).

   SELF TEST PRINTING.

   PLEASE PRESS PAPER FEED BUTTON

5. Press the FEED button to continue printing. The printer prints a pattern using the built-in character set.
6. The self-test automatically ends and cuts the paper after printing the following.

   **** End Self-Test ****

Figure 17

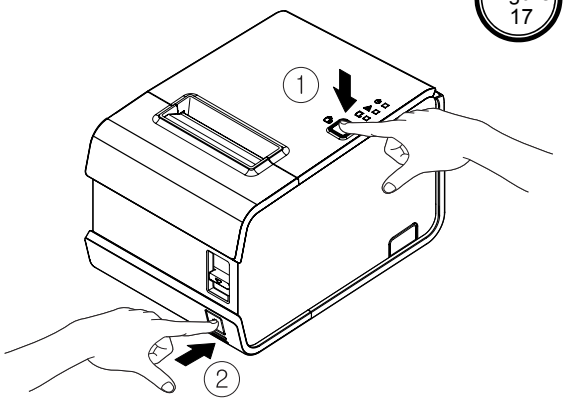
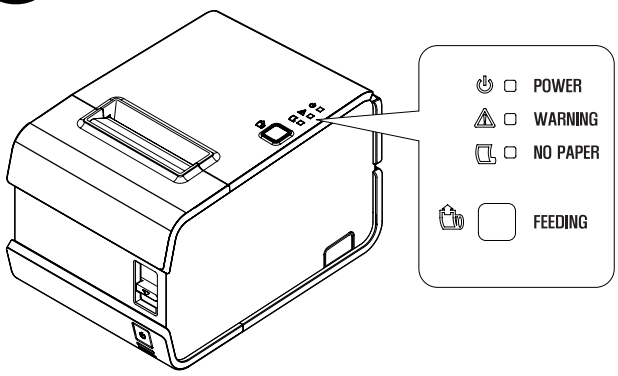


Figure 18



3.2.3 The Self Test Mode - continue

The printer is ready to receive data as soon as it completes the self-test.

SAM4S ELLIX 20

VERSION STD 1.04
PGM CHECKSUM : 9724

SERIAL(RS-232C) INTERFACE
BAUD RATE : 115200 BPS
PARITY : NONE
DATA BITS : 8 BITS
RECEIVE ERROR : PRINTS '?'
HANDSHAKING : DTR/DSR
EMULATION : EPSON
USE KP BELL : NO
AUTO-CUTTER : Enable
PRINT DENSITY :
LIGHT[1 2 3 4]DARK

DIP S/W status(memory S/W 1,2)
Memory DIP switch Report

DIP SW1	1 2 3 4 5 6 7 8
ON	
OFF	■■■■■■■■

DIP SW2	1 2 3 4 5 6 7 8
ON	
OFF	■■■■■■■■

DIP Switch Information
DIP SW 1(DIP SW8 - OFF)

SW	FUNCTION	ON	OFF
1	Handshaking	XON/XOFF	DSR/DTR
2	Word length	7bit	8bit
3	Parity check	Yes	No
4	Parity select	Even	Odd
5 6 7	Baudrate select	Table 1-1	
8	DIP SW select	DIP SW2	DIP SW1

Table 1-1 : Baudrate table

Transmission speed	SW5	SW6	SW7
2400 Baud	ON	ON	ON
4800 Baud	ON	ON	OFF
9600 Baud	ON	OFF	ON
14400 Baud	ON	OFF	OFF
19200 Baud	OFF	ON	ON
38400 Baud	OFF	ON	OFF
57600 Baud	OFF	OFF	ON
115200 Baud	OFF	OFF	OFF

DIP SW 2(DIP SW8 - ON)

SW	FUNCTION	ON	OFF
1	Mode select	STAR	EPSON
2	Kitchen bell	Enable	Disable
3	Auto cutter	Disable	Enable
4	Self test	HexaDump	SelfTest
5 6	Print density	Table 2-1	
7	Receive Error	Ignore	Print ?
8	DIP SW select	DIP SW2	DIP SW1

Table 2-1 : Print density table

Print Density	SW5	SW6
1(Light)	ON	ON
2	OFF	OFF
3	ON	OFF
4(Dark)	OFF	ON

SELF TEST PRINTING.
PLEASE PRESS PAPER FEED BUTTON

```
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXY
123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
23456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[
3456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\
456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]
56789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^
6789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_
789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'
89:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'a
9:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'ab
:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abc
;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcd
<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcde
=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdef
>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefg
?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefgh
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghi
ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghij
BCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijk
CDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijkl
DEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklm
EFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmn
FGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmno
GHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnop
HIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopq
IJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqr
JKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrs
KLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrst
LMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrstu
MNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrstuv
NOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrstuvw
OPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrstuvwx
PQRSTUVWXYZ[\]^_'abcdefghijklmnopqrstuvwxy
QRSTUVWXYZ[\]^_'abcdefghijklmnopqrstuvwxyz
RSTUVWXYZ[\]^_'abcdefghijklmnopqrstuvwxyz{
STUVWXYZ[\]^_'abcdefghijklmnopqrstuvwxyz{|
TUVWXYZ[\]^_'abcdefghijklmnopqrstuvwxyz{|}
UVWXYZ[\]^_'abcdefghijklmnopqrstuvwxyz{|}~
VWXYZ[\]^_'abcdefghijklmnopqrstuvwxyz{|}~0
WXYZ[\]^_'abcdefghijklmnopqrstuvwxyz{|}~01
XYZ[\]^_'abcdefghijklmnopqrstuvwxyz{|}~012
YZ[\]^_'abcdefghijklmnopqrstuvwxyz{|}~0123
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXY
123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
23456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[
3456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\
456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]
56789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^
6789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_
789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'
89:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'a
9:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'ab
:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abc
;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcd

** End Self-Test **
```

• Self-Test sheet (ex: Serial Interface)

3.2.4 Control Command

HT

[Name] Horizontal Tab.

[Format] ASCII HT

Hex 09

Decimal 9

[Description] Move the print position to the next horizontal tab position.

LF

[Name] Print and line feed.

[Format] ASCII LF

Hex 0A

Decimal 10

[Description] Print the data in the print buffer and feeds one line based on the current line spacing.

FF

[Name] Print and return to standard mode in page mode.

[Format] ASCII FF

Hex 0C

Decimal 12

[Description] Print the data in the print buffer collectively and returns to standard mode.

CR

[Name] Print and carriage return.

[Format] ASCII CR

Hex 0D

Decimal 13

[Description] This command is ignored.

CAN

[Name] Cancel print data in page mode.

[Format] ASCII CAN

Hex 18

Decimal 24

[Description] In page mode, deletes all the print data in the current printable area.

3.2.4 Control Command - continue

DLE EOT *n*

[Name] Transmit real-time status.

[Format]

ASCII	DLE	EOT	*n*
Hex	10	04	*n*
Decimal	16	4	*n*

[Range] $1 \le n \le 4$

[Description] Transmit the selected printer status specified by *n* in real time, according to the following parameters: [*n* = 1 : Printer status]

Bit	ON/OFF	Hex	Decimal	Function
0	OFF	00	0	Not used. Fixed to off.
1	ON	02	2	Not used. Fixed to on.
2	OFF	00	0	Drawer open/close signal is LOW (connector pin 3).
	ON	04	4	Drawer open/close signal is HIGH (connector pin 3).
3	OFF	00	0	On-line.
	ON	08	8	Off-line.
4	ON	10	16	Not used. Fixed to on.
5-6	-	-	-	Undefined.
7	OFF	00	0	Not used. Fixed to off.

[*n* = 2 : Off-line status]

Bit	ON/OFF	Hex	Decimal	Function
0	OFF	00	0	Not used. Fixed to off.
1	ON	02	2	Not used. Fixed to on.
2	OFF	00	0	Cover is closed.
	ON	04	4	Cover is open.
3	OFF	00	0	Paper is not being fed by using the PAPER FEED button.
	ON	08	8	Paper is being fed by the PAPER FEED button.
4	ON	10	16	Not used. Fixed to on.
5	OFF	00	0	No paper-end stops.
	ON	20	32	Printing stops due to paper end.
6	OFF	00	0	No error.
	ON	40	64	Error occurs.
7	OFF	00	00	Not used. Fixed to off.

- Bit 5 : Becomes on when the paper end sensor detects paper end and printing stops.

3.2.4 Control Command - continue

DLE EOT *n* - continue

[*n* = 3 : Error status]

Bit	ON/OFF	Hex	Decimal	Function
0	OFF	00	0	Not used. Fixed to off.
1	ON	02	2	Not used. Fixed to on.
2	-	-	-	Undefined.
3	OFF	00	0	No auto-cutter error.
	ON	08	8	Auto-cutter error occurs.
4	ON	10	16	Not used. Fixed to on.
5	OFF	00	0	No unrecoverable error.
	ON	20	32	Unrecoverable error occurs.
6	OFF	00	0	No auto-recoverable error.
	ON	40	64	Auto recoverable error occurs.
7	OFF	00	0	Not used. Fixed to off.

- Bit 5 : If these errors occur due to paper jams or the like, it is possible to recover by correcting the cause of the error and executing **DLE ENQ *n***($1 \le n \le 2$). If an error due to a circuit failure (e.g. wire break) occurs, it is impossible to recover.
- Bit 6 : When printing is stopped due to high print head temperature until the print head temperature drops sufficiently or when the paper roll cover is open during printing, Bit 6 is on.

[*n* = 4 : Continuous paper sensor status]

Bit	ON/OFF	Hex	Decimal	Function
0	OFF	00	0	Not used. Fixed to off.
1	ON	02	2	Not used. Fixed to on.
2	OFF	00	0	Paper roll near-end sensor. Paper adequate.
3	ON	0C	12	Paper near-end is detected by the paper roll near-end sensor.
4	ON	10	16	Not used. Fixed to on.
5	OFF	00	0	Not roll end sensor. Paper present.
6	ON	60	96	Paper is detected by the paper roll end sensor.
7	OFF	00	0	Not used. Fixed to off.

3.2.4 Control Command - continue

DLE ENQ *n*

[Name] Real-time is request to printer.

[Format]

ASCII	DLE	ENQ	*n*
Hex	10	05	*n*
Decimal	16	5	*n*

[Range] $1 \le n \le 2$

[Description] Recover from an error and restart printing from the line where the error occurred

n	Request
0	Works the same as when the paper FEED button is pressed once during waiting status during the operation of the **GS ^** command.
1	Recovers from an error and restarts printing from the line where the error occurred.
2	Recovers from an error after clearing the receive and print buffers.

DLE DC4 *fn m t* (*fn* = 1)

[Name] Generate pulse in real-time

[Format]

ASCII	DLE	DC4	*fn*	*m*	*t*
HEX	10	14	*1*	*m*	*t*
Decimal	16	20	*1*	*m*	*t*

[Range] $0 \le m \le 8$

$1 \le t \le 8$

[Description] Output the pulse specified by *t* in real-time to the connector pin specified by *m* as follows:

m	Connector Pin #
0	2
1	5

- The pulse ON time and OFF time is set to [t x 100 ms].

DLE DC4 *fn a b* (*fn* = 2)

[Name] Generate pulse in real-time

[Format]

ASCII	DLE	DC4	*fn*	*a*	*b*
HEX	10	14	*2*	*a*	*b*
Decimal	16	20	*2*	*a*	*b*

[Range] *a* = 1 *b* = 8

[Description] Execute the printer power-off.

- Store the values of the maintenance counter.

3.2.4 Control Command - continue

DLE DC4 *fn d1 … d7* (*fn* = 8)

[Name] Clear buffer(s)

[Format]

ASCII	DLE	DC4	*fn*	*d1… d7*
HEX	10	14	*2*	*d1… d7*
Decimal	16	20	*2*	*d1… d7*

[Range] *d1* = 1 *d2* = 3 *d3* = 20 *d4* = 1 *d5* = 6 *d7* = 2 *d8* = 8

[Description] Clear all data stored in the receive buffer and the print buffer.

• Transmits the following three bytes of data

	Hexadecimal	Decimal	Amount of data
Header	37H	55	1 byte
Flag	25H	37	1 byte
NUL	00H	0	1 byte

•Enter standard mode.

ESC FF

[Name] Print data in page mode

[Format]

ASCII	ESC	FF	
Hex	1B	0C	
Decimal	27	12	

[Description] In page mode, print all buffered data in the printing area collectively.

ESC SP *n*

[Name] Set right-side character spacing.

[Format]

ASCII	ESC	SP	*n*
Hex	1B	20	*n*
Decimal	27	32	*n*

[Range] $0 \le n \le 255$

[Default] *n* = 0

[Description] Set the character spacing for the right side of the character to [*n* x horizontal or vertical motion units].

ESC ! *n*

[Name] Select print modes.

[Format]

ASCII	ESC	!	*n*
Hex	1B	21	*n*
Decimal	27	33	*n*

[Range] $0 \le n \le 255$

[Default] *n* = 0

3.2.4 Control Command - continue

ESC ! *n* - continue

[Description] Select print mode(s) using n as follows:

Bit	ON/OFF	Hex	Decimal	Function
0	Off	00	0	Character font A (12 × 24)
	On	01	1	Character font B (9 × 17)
1-2	-	-	-	Undefined.
3	Off	00	0	Emphasized mode not selected.
	On	08	8	Emphasized mode selected.
4	Off	00	0	Double-height mode not selected.
	On	10	16	Double-height mode selected.
5	Off	00	0	Double-width mode not selected.
	On	20	32	Double-width mode selected.
6	-	-	-	Undefined.
7	Off	00	0	Underline mode not selected.
	On	80	128	Underline mode selected.

ESC $ *nL nH*

[Name] Set absolute print position.

[Format]

ASCII	ESC	$	*nL*	*nH*
Hex	1B	24	*nL*	*nH*
Decimal	27	36	*nL*	*nH*

[Range] $0 \le nL \le 255$

$0 \le nH \le 255$

[Description] Set the distance from the beginning of the line to the position at which subsequent characters are to be printed.

The distance from the beginning of the line to the print position is [($nL + nH \times 256$) × (vertical or horizontal motion unit)] inches.

3.2.4 Control Command - continue

ESC % *n*

[Name] Select/Cancel user-defined character set.

[Format]

ASCII	ESC	%	*n*
Hex	1B	25	*n*
Decimal	27	37	*n*

[Range] $0 \le n \le 255$

[Default] $n = 0$

[Description] Select or cancel the user-defined character set.

- When the LSB of n is 0, the user-defined character set is canceled.
- When the LSB of n is 1, the user-defined character set is selected.

ESC & *y c1 c2 [x1 d1...d(y × x1)]...[xk d1...d(y × xk)]*

[Name] Define user-defined characters.

[Format]

ASCII	ESC	&	*y*	*c1*	*c2*	*[x1 d1...d(y × x1)]...[xk d1...d(y × xk)]*
Hex	1B	26	*y*	*c1*	*c2*	*[x1 d1...d(y × x1)]...[xk d1...d(y × xk)]*
Decimal	27	38	*y*	*c1*	*c2*	*[x1 d1...d(y × x1)]...[xk d1...d(y × xk)]*

[Range] $y = 3$

$32 \le c1 \le c2 \le 126$

$0 \le x \le 12$ Font A (12 × 24)

$0 \le x \le 9$ Font B (9 × 17)

$0 \le d1 \ldots d(y \times xk) \le 255$

[Description] Define user-defined characters.

- *y* specifies the number of bytes in the vertical direction.
- *c1* specifies the beginning character code for the definition, and *c2* specifies the final code.
- *x* specifies the number of dots in the horizontal direction.
- *d* specifies the definition data

ESC * *m nL nH d1…dk*

[Name] Select bit-image mode.

[Format

ASCII	ESC	*	*m*	*nL*	*nH*	*d1 … dk*
Hex	1B	2A	*m*	*nL*	*nH*	*d1 … dk*
Decimal	27	42	*m*	*nL*	*nH*	*d1 … dk*

[Range] $m = 0, 1, 32, 33$

$1 \le (nL + nH \times 256) \le 1023$ $(0 \le nL \le 255 , 0 \le nH \le 3)$

$0 \le d \le 255$

3.2.4 Control Command - continue

ESC * *m nL nH d1…dk* - continue

[Description] Select a bit-image mode using m for the number of dots specified by *nL* and *nH*, as follows:

m	Mode	Vertical Direction		Horizontal Direction	
		Number of Dots	Dot Density	Dot Density	Number of Data(*k*)
0	8-dot single-density	8	60 DPI	90 DPI	*nL* + *nH* x 256
1	8-dot double-density	8	60 DPI	180 DPI	*nL* + *nH* x 256
32	24-dot single-density	24	180 DPI	90 DPI	(*nL* + *nH* x 256) x 3
33	24-dot double-density	24	180 DPI	180 DPI	(*nL* + *nH* x 256) x 3

ESC _ *n*

[Name] Turn underline mode on/off.

[Format] ASCII ESC _ *n*

Hex 1B 2D *n*

Decimal 27 45 *n*

[Range] $0 \le n \le 2$

$48 \le n \le 50$

[Default] $n = 0$

[Description] Turn underline mode on or off, based on the following values of *n*:

n	Function
0, 48	Turn off underline mode.
1, 49	Turn on underline mode (1-dot thick).
2, 50	Turn on underline mode (2-dots thick).

ESC 2

[Name] Select default line spacing.

[Format] ASCII ESC 2

Hex 1B 32

Decimal 27 50

[Description] Select 1/6-inch line (approximately 4.23mm) spacing.

3.2.4 Control Command - continue

ESC 3 *n*

[Name] Set line spacing.

[Format]

ASCII	ESC	3	*n*
Hex	1B	33	*n*
Decimal	27	51	*n*

[Range] $0 \le n \le 255$

[Default] Approximately 4.23 mm (1/6 “)

[Description] Set the line spacing to [*n* × vertical or horizontal motion unit] inches.

ESC = *n*

[Name] Set peripheral device.

[Format]

ASCII	ESC	=	*n*
Hex	1B	3D	*n*
Decimal	27	61	*n*

[Range] $0 \le n \le 1$

[Description] Select device to which host computer sends data, using *n* as follows:

Bit	ON/OFF	Hex	Decimal	Function
0	Off	00	0	Printer disabled.
	On	01	1	Printer enabled.
1-7	-	-	-	Undefined.

ESC ? *n*

[Name] Cancel user-defined characters.

[Format]

ASCII	ESC	?	*n*
Hex	1B	3F	*n*
Decimal	27	63	*n*

[Range] $32 \le n \le 126$

[Description] Cancel user-defined characters.

ESC @

[Name] Initialize printer.

[Format]

ASCII	ESC	@
Hex	1B	40
Decimal	27	64

[Description] Clear the data in the print buffer and reset the printer mode to the mode that was in effect when the power was turned on.

3.2.4 Control Command - continue

ESC D *n1...nk NUL*

[Name] Set horizontal tab positions.

[Format]

ASCII	ESC	D	*n1...nk*	*NUL*
Hex	1B	44	*n1...nk*	*00*
Decimal	27	68	*n1...nk*	*0*

[Range] $1 \le n \le 255$

$0 \le k \le 32$

[Default] n = 8, 16, 24, 32, 40 … 232, 240, 248

[Description] Set horizontal tab position.

- n specifies the column number for setting a horizontal tab position from the beginning of the line.
- k indicates the total number of horizontal tab positions to be set.

ESC E *n*

[Name] Turn emphasized mode on/off.

[Format]

ASCII	ESC	E	*n*
Hex	1B	45	*n*
Decimal	27	69	*n*

[Range] $0 \le n \le 255$

[Default] n = 0

[Description] Turn emphasized mode on or off.

- When the LSB is 0, emphasized mode is turned off.
- When the LSB is 1, emphasized mode is turned on.

ESC G *n*

[Name] Turn on/off double-strike mode.

[Format]

ASCII	ESC	G	*n*
Hex	1B	47	*n*
Decimal	27	71	*n*

[Range] $0 \le n \le 255$

[Default] n = 0

[Description] Turn double-strike mode on or off.

- When the LSB is 0, double-strike mode is turned off.
- When the LSB is 1, double-strike mode is turned on.

3.2.4 Control Command - continue

ESC J *n*

[Name] Print and feed paper.

[Format]

ASCII	ESC	J	*n*
Hex	1B	4A	*n*
Decimal	27	74	*n*

[Range] $0 \le n \le 255$

[Description] Print the data in the print buffer and feeds the paper [*n* × vertical or horizontal motion unit] inches unit.

ESC L

[Name] Select page mode

[Format]

ASCII	ESC	L
Hex	1B	4C
Decimal	27	76

[Description] Switch from standard mode to page mode.

ESC M *n*

[Name] Select character font.

[Format]

ASCII	ESC	M	*n*
Hex	1B	4D	*n*
Decimal	27	77	*n*

[Range] *n* = 0, 1, 48, 49

[Default] *n* = 0

[Description] Select character fonts.

n	Function
0, 48	Character font A (12 × 24) selected.
1, 49	Character font B (9 × 17) selected.

ESC R *n*

[Name] Select an international character set.

[Format]

ASCII	ESC	R	*n*
Hex	1B	52	*n*
Decimal	27	82	*n*

[Range] *n* = 0

$0 \le n \le 13$

3.2.4 Control Command - continue

ESC R *n* - continue

[Default] Except for Korean model : *n* = 0

For Korean model : *n* = 13

[Description] Select an international character set *n* from the following table.

n	Character Set	*n*	Character Set
0	U.S.A.	7	Spain
1	France	8	Japan
2	Germany	9	Norway
3	U.K.	10	Denmark II
4	Denmark I	11	Spain II
5	Sweden	12	Latin America
6	Italy	13	Korea

ESC S

[Name] Select standard mode

[Format] ASCII ESC S

Hex 1B 53

Decimal 27 83

[Description] Switch from page mode to standard mode.

ESC T *n*

[Name] Select print direction in page mode

[Format] ASCII ESC T *n*

Hex 1B 54 *n*

Decimal 27 84 *n*

[Range] $0 \le n \le 3$

$48 \le n \le 51$

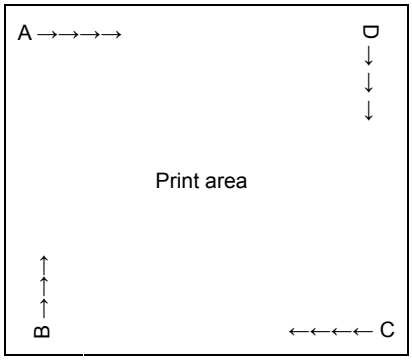
[Default] *n* = 0

3.2.4 Control Command - continue

ESC T *n* - continue

[Description] Select the print direction and starting position in page mode. *n* specifies the print direction and starting position as follows:

n	Print Direction	Starting Position
0, 48	Left to right	Upper left (A in the figure)
1, 49	Bottom to top	Lower left (B in the figure)
2, 50	Right to left	Lower right (C in the figure)
3, 51	Top to bottom	Upper right (D in the figure)



ESC V *n*

[Name] Turn 90°clockwise rotation mode on/off.

[Format]

ASCII	ESC	V	*n*
Hex	1B	56	*n*
Decimal	27	86	*n*

[Range] $0 \le n \le 1$ $48 \le n \le 49$

[Default] $n = 0$

[Description] Turn 90°clockwise rotation mode on/off n is used as follows:

n	Function
0, 48	Turn off 90°clockwise rotation mode.
1, 49 2, 50	Turn on 90°clockwise rotation mode.

ESC W *xL xH yL yH dxL dxH dyL dyH*

[Name] Set printing area in page mode

[Format]

ASCII	ESC	W	*xL*	*xH*	*yL*	*yH*	*dxL*	*dxH*	*dyL*	*dyH*
Hex	1B	57	*xL*	*xH*	*yL*	*yH*	*dxL*	*dxH*	*dyL*	*dyH*
Decimal	27	87	*xL*	*xH*	*yL*	*yH*	*dxL*	*dxH*	*dyL*	*dyH*

[Range]

$0 \le (xL + xH \times 256) \le 65535$	$(0 \le xL \le 255, 0 \le xH \le 255)$
$0 \le (yL + yH \times 256) \le 65535$	$(0 \le yL \le 255, 0 \le yH \le 255)$
$1 \le (dxL + dxH \times 256) \le 65535$	$(0 \le dxL \le 255, 0 \le dxH \le 255)$
$1 \le (dyL + dyH \times 256) \le 65535$	$(0 \le dyL \le 255, 0 \le dyH \le 255)$

3.2.4 Control Command - continue

ESC W *xL xH yL yH dxL dxH dyL dyH* - continue

[Default] • When a paper width of 80mm is selected : *x0* = *y0* = 0, *dx* = 512, *dy* = 1662

• When a paper width of 58mm is selected : *x0* = *y0* = 0, *dx* = 360, *dy* = 1662

[Description] The horizontal starting position, vertical staring position, printing area width, and printing area height are defined as *x0, y0, dx* ,*dy* respectively.

• *x0* = [(*xL* + *xH* × 256)] × (horizontal motion unit)]

• *y0* = [(*yL* + *yH* × 256)] × (vertical motion unit)]

• *dx* = [(*dxL* + *dxH* × 256)] x (horizontal motion unit)]

• *dy* = [(*dyL* + *dyH* × 256)] x (vertical motion unit)]

ESC \ *nL nH*

[Name] Set relative print position.

[Format]

ASCII	ESC	\	*nL*	*nH*
Hex	1B	5C	*nL*	*nH*
Decimal	27	92	*nL*	*nH*

[Range] 0 ≤ *nL* ≤ 255

0 ≤ *nH* ≤ 255

[Description] Set the print starting position based on the current position by using the horizontal or vertical motion unit.

This command sets the distance from the current position to [(*nL* + *nH* × 256) × horizontal or vertical motion unit]

ESC a *n*

[Name] Select justification.

[Format]

ASCII	ESC	a	*n*
Hex	1B	61	*n*
Decimal	27	97	*n*

[Range] 0 ≤ *n* ≤ 2

48 ≤ *n* ≤ 50

[Default] *n* = 0

[Description] Align all the data in one line to the specified position. *n* selects the type of justification as follows:

n	Justification
0, 48	Left justification
1, 49	Centering
2, 50	Right justification

3.2.4 Control Command - continue

ESC c 3 *n*

[Name] Select paper sensor(s) to output paper end signals.

[Format]

ASCII	ESC	c	3	*n*
Hex	1B	63	33	*n*
Decimal	27	99	51	*n*

[Range] $0 \le n \le 255$

[Default] $n = 12$

[Description] Select the paper sensor(s) to output paper end signals. Each bit of *n* is used as follows:

Bit	ON/OFF	Hex	Decimal	Function
0	Off	00	0	Paper roll near-end sensor disabled.
	On	01	1	Paper roll near-end sensor enabled.
1	Off	00	0	Paper roll near-end sensor disabled.
	On	02	2	Paper roll near-end sensor enabled.
2	Off	00	0	Paper roll end sensor disabled.
	On	04	4	Paper roll end sensor enabled.
3	Off	00	0	Paper roll end sensor disabled.
	On	08	8	Paper roll end sensor enabled.
4-7	-	-	-	Undefined.

• This command is available only with a parallel interface and is ignored with a serial interface.

ESC c 4 *n*

[Name] Select paper sensor(s) to stop printing.

[Format]

ASCII	ESC	c	4	*n*
Hex	1B	63	34	*n*
Decimal	27	99	52	*n*

[Range] $0 \le n \le 255$

[Default] $n = 0$

[Description] Select the paper sensor(s) used to stop printing when a paper-end is detected, using *n* as follows:

Bit	ON/OFF	Hex	Decimal	Function
0	Off	00	0	Roll paper near-end sensor disabled.
	On	01	1	Roll paper near-end sensor enabled.
1	Off	00	0	Roll paper near-end sensor disabled.
	On	02	2	Roll paper near-end sensor enabled.
2-7	-	-	-	Undefined.

3.2.4 Control Command - continue

ESC c 5 *n*

[Name] Enable/Disable panel buttons.

[Format]

ASCII	ESC	c	5	*n*
Hex	1B	63	35	*n*
Decimal	27	99	53	*n*

[Range] $0 \le n \le 255$

[Default] $n = 0$

[Description] Enable or disable the panel buttons.

- When the LSB is 0, the panel buttons are enabled.
- When the LSB is 1, the panel buttons are disabled.

Bit	ON/OFF	Hex	Decimal	Function
0	OFF	00	0	FEED button enable.
	ON	01	1	FEED button disable.
1	OFF	00	0	Power button enable.
	ON	02	2	Power button disable.
2-7	-	-	-	Undefined.

ESC d *n*

[Name] Print and feed n lines.

[Format]

ASCII	ESC	d	*n*
Hex	1B	64	*n*
Decimal	27	100	*n*

[Range] $0 \le n \le 255$

[Description] Print the data in the print buffer and feed *n* lines.

ESC p *m t1 t2*

[Name] Generate pulse.

[Format]

ASCII	ESC	p	m	*t1*	*t2*
Hex	1B	70	m	*t1*	*t2*
Decimal	27	112	m	*t1*	*t2*

[Range] $m = 0, 1, 48, 49$

$0 \le t1 \le 255$

$0 \le t2 \le 255$

3.2.4 Control Command - continue

ESC p *m t1 t2*

[Description] Output the pulse specified by *t1* & *t2* to connector pin *m* as follows:

m	Connector Pin
0,48	Drawer kick-out connector pin 2
1,49	Drawer kick-out connector pin 5

- *t1* specifies the pulse ON time as [*t1* × 2 ms] and *t2* specifies the pulse OFF time as [*t2* × 2 ms].
- If *t2* is smaller than *t1*, OFF time is set as [*t1* × 2 ms].

ESC t *n*

[Name] Select character code table.

[Format]

ASCII	ESC	t	*n*
Hex	1B	74	*n*
Decimal	27	116	*n*

[Range] *n* = 255

$0 \le n \le 5$

$16 \le n \le 19$

[Default] *n* = 0

[Description] Select a page *n* from the character code table.

n	Page
0	PC437 [U.S.A., standard Europe]
1	Katakana
2	PC850 [Multilingual]
3	PC860 [Portuguese]
4	PC863 [Canadian-French]
5	PC865 [Nordic]
16	WPC1252
17	PC866 [Cyrillic #2]
18	PC852 [Latin 2]
19	PC858 [EURO]
255	Space page

3.2.4 Control Command - continue

ESC { *n*

[Name] Turn on/off upside-down printing mode.

[Format]

ASCII	ESC	{	*n*
Hex	1B	7B	*n*
Decimal	27	123	*n*

[Range] $0 \le n \le 255$

[Default] $n = 0$

[Description] Turn upside-down printing mode on or off.

- When the LSB is 0, upside-down printing mode is turned off.
- When the LSB is 1, upside-down printing mode is turned on.

FS p *n m*

[Name] Print NV bit image

[Format]

ASCII	FS	p	*n*	*m*
Hex	1C	70	*n*	*m*
Decimal	28	112	*n*	*m*

[Range] $1 \le n \le 255$

$0 \le m \le 3$

$48 \le m \le 51$

[Description] Print a NV bit image *n* using the mode specified by *m*.

m	Mode	Vertical Dot Density (DPI)	Horizontal Dot Density (DPI)
0.48	Normal	180	180
1.49	Double-width	180	90
2.50	Double-height	90	180
3.51	Quadruple	90	90

- *n* is the number of the NV bit image (defined using the **FS q** command).
- *m* specifies the bit image mode.

FS q *n [xL xH yL yH d1…dk]1…[xL xH yL yH d1…dk]n*

[Name] Define NV bit image

[Format]

ASCII	FS	q	n	*[xL xH yL yH d1…dk]1…[xL xH yL yH d1…dk]n*
Hex	1C	71	n	*[xL xH yL yH d1…dk]1…[xL xH yL yH d1…dk]n*
Decimal	28	113	n	*[xL xH yL yH d1…dk]1…[xL xH yL yH d1…dk]n*

[Range] $1 \le n \le 255$

$0 \le d \le 255$

3.2.4 Control Command - continue

FS q *n [xL xH yL yH d1…dk]1…[xL xH yL yH d1…dk]n* - continue

[Range] $1 \le (xL + xH \times 256) \le 1023$ $(0 \le xL \le 255,\ 0 \le xH \le 3)$

$1 \le (yL + yH \times 256) \le 288$ $(0 \le yL \le 255,\ yL = 0,1)$

$k = (xL + xH \times 256) \times (yL + yH \times 256) \times 8$

- Either one of the total capacity data [0, 64K, 128K, 192K, 256K, 320K, 384K] bytes can be selected by **GS (E**.

The default value is 384KB.

[Description] Define the NV bit image specified by *n*.

- *n* specifies the number of the defined NV bit image.
- *xL, xH* specifies $(xL + xH \times 256) \times 8$ dots in the horizontal direction for the NV bit image you are defining.
- *yL, yH* specifies $(yL + yH \times 256) \times 8$ dots in the vertical direction for the NV bit image you are defining.
- If this command is processed when NV graphics are defined with **GS (L** or **GS 8 L**, deletes all NV graphics data, then defines the bit image data with this command.

GS ! *n*

[Name] Select character size.

[Format]

ASCII	GS	!	*n*
Hex	1D	21	*n*
Decimal	29	33	*n*

[Range] $0 \le n \le 255$ ($1 \le$ vertical number of times ≤ 8, $1 \le$ horizontal number of times ≤ 8)

[Default] $n = 0$

[Description] Select the character height using bits 0 to 2 and selects the character width using bits 4 to 7, as following:

Bit	Function
0-3	Character height selection. See Table 2
4-7	Character width selection. See Table 1

[Table1] Character Width Selection

Hex	Decimal	Width
00	0	1 (normal)
10	16	2 (double-width)
20	32	3
30	48	4
40	64	5
50	80	6
60	96	7
70	112	8

[Table2] Character Height Selection

Hex	Decimal	Height
00	0	1 (normal)
01	1	2 (double-height)
02	2	3
03	3	4
04	4	5
05	5	6
06	6	7
07	7	8

3.2.4 Control Command - continue

GS $ *nL nH*

[Name] Set absolute vertical print position in page mode

[Format]

ASCII	GS	$	*nL*	*nH*
Hex	1D	24	*nL*	*nH*
Decimal	29	36	*nL*	*nH*

[Range] $0 \le nL \le 255$

$0 \le nH \le 255$

[Description] Set the absolute vertical print starting position for buffer character data in page mode.

This command sets the absolute print position to [(*nL* + *nH* × 256) × (vertical or horizontal motion unit)] inches.

GS (A *pL pH n m*

[Name] Execute test print

[Format]

ASCII	GS	(	A	*pL*	*pH*	*n*	*m*
Hex	1D	28	41	*pL*	*pH*	*n*	*m*
Decimal	29	40	65	*pL*	*pH*	*n*	*m*

[Range] $(pL + pH \times 256) = 2$ ($pL = 2$, $pH = 0$)

$0 \le n \le 2$

$48 \le n \le 50$

$1 \le m \le 3$

$49 \le m \le 51$

[Description] Execute a test print with a specified test pattern on a specified paper type (roll paper).

n specify the paper type as listed below to be tested :

n	Paper type
0,48 1,49 2,50	Roll paper

m specify a test pattern as listed below :

m	Test pattern
1,49	Hexadecimal dump
2,50	Printer status print
3,51	Rolling pattern print

3.2.4 Control Command - continue

GS (C *pL pH m fn b [c1 c2] [d1…dk]*

[Name] Edit user NV memory

[Description] Delete, store, and move data in the NV user memory specified by the function code *fn*.

fn	Format	No.	Function
0,48	**GS (C *pL pH m fn b c1 c2***	0	Delete the specified record.
1,49	**GS (C *pL pH m fn b c1 c2 d1…dk***	1	Store data in the specified record.
2,50	**GS (C *pL pH m fn b c1 c2***	2	Transmit the data in the specified record
3,51	**GS (C *pL pH m fn b***	3	Transmit the number of bytes of memory used.
4,52	**GS (C *pL pH m fn b***	4	Transmit the number of bytes of remaining memory (unused area).
5,53	**GS (C *pL pH m fn b***	5	Transmit the key code list identifying the stored record.
6,54	**GS (C *pL pH m fn b d1 d2 d3***	6	Delete all data in the NV user memory.

• *pL, pH* specify (*pL* + *pH* × 256) for the number of bytes after *pH* (*m, fn, b, [c1 c2], [d1…dk]*).

• *c1, c2* specify the key code (which identifies the record).

GS (C *pL pH m fn b c1 c2* (*fn* = 0, 48) **Function 0**

[Format]

ASCII	GS	(	C	*pL*	*pH*	*m*	*fn*	*b*	*c1*	*c2*
Hex	1D	28	43	*pL*	*pH*	*m*	*fn*	*b*	*c1*	*c2*
Decimal	29	40	67	*pL*	*pH*	*m*	*fn*	*b*	*c1*	*c2*

[Range] (*pL* + *pH* × 256) = 5 (*pL* = 5, *pH* = 0)

m = 0 *b* = 0

32 ≤ *c1* ≤ 126

32 ≤ *c2* ≤ 126

[Description] Delete the specified record specified by *c1* and *c2* in the NV user memory.

GS (C *pL pH m fn b c1 c2 d1...dk* (*fn* = 1, 49) **Function 1**

[Format]

ASCII	GS	(	C	*pL*	*pH*	*m*	*fn*	*b*	*c1*	*c2*	*d1...dk*
Hex	1D	28	43	*pL*	*pH*	*m*	*fn*	*b*	*c1*	*c2*	*d1...dk*
Decimal	29	40	67	pL	*pH*	*m*	*fn*	*b*	*c1*	*c2*	*d1...dk*

[Range] 6 ≤ (*pL* + *pH* × 256) ≤ 65535 (0 ≤ *pL* ≤ 255, 0 ≤ *pH* ≤ 255)

m = 0 *b* = 0

32 ≤ *c1* ≤ 126 32 ≤ *c2* ≤ 126

32 ≤ *d* ≤ 254

k = (*pL* + *pH* × 256) - 5

[Description] Store the data in the record specified by *c1* and *c2* in the NV user memory.

The new data overwrites the data already stored, if there is data already stored.

3.2.4 Control Command - continue

GS (C *pL pH m fn b c1 c2* (*fn* = 2, 50) **Function 2**

[Format]	ASCII	GS	(	C	*pL*	*pH*	*m*	*fn*	*b*	*c1*	*c2*
	Hex	1D	28	43	*pL*	*pH*	*m*	*fn*	*b*	*c1*	*c2*
	Decimal	29	40	67	*pL*	*pH*	*m*	*fn*	*b*	*c1*	*c2*

[Range] (*pL* + *pH* × 256) = 5 (*pL* = 5, *pH* = 0)

m = 0 32 ≤ *c1* ≤ 126

b = 0 32 ≤ *c2* ≤ 126

[Description] Transmit data for the record specified by *c1, c2* in the NV user memory.

	Hexadecimal	Decimal	Amount of Data
Header	37H	55	1 byte
Flag	70H	112	1 byte
Status	40H or 41H	64 or 65	1 byte
Data	20H - FEH	32 - 254	0 through 80 bytes
NUL	00H	0	1 byte

If the specified record cannot be detected, the following data is transmitted:

	Hexadecimal	Decimal	Amount of Data
Header	37H	55	1 byte
Flag	70H	112	1 byte
Status	40H	64	1 byte
NUL	00H	0	1 byte

After [Header – NUL] is transmitted, the printer receives a response from the host: Then it performs the process defined in the response. See the tables below. When the status (existence of the next data block) is Hexadecimal = 41H / Decimal = 65

Response		Process Performed
ASCII	**Decimal**	
ACK	6	Transmits the next data
NAK	21	Transmits the previous data again
CAN	24	Ends the process

When the status (existence of the next data block) is Hexadecimal = 40H / Decimal = 64

Response		Process Performed
ASCII	**Decimal**	
ACK	6	Ends the process
NAK	21	Transmits the previous data again
CAN	24	Cancels the process

3.2.4 Control Command - continue

GS (C *pL pH m fn b* (*fn* = 3, 51) **Function 3**

[Format]

ASCII	GS	(	C	*pL*	*pH*	*m*	*fn*	*b*
Hex	1D	28	43	*pL*	*pH*	*m*	*fn*	*b*
Decimal	29	40	67	*pL*	*pH*	*m*	*fn*	*b*

[Range] (*pL* + *pH* × 256) = 3 (*pL* = 3, *pH* = 0)

m = 0

b = 0

[Description] Transmit the number of bytes of memory used in the NV user memory.

	Hexadecimal	Decimal	Amount of Data
Header	37H	55	1 byte
Flag	28H	40	1 byte
Number of Bytes of Memory Used	30H - 39H	48 - 57	1 - 6 bytes
NUL	00H	0	1 byte

GS (*C pL pH m fn b* (*fn* = 4, 52) **Function 4**

[Format]

ASCII	GS	(	C	*pL*	*pH*	*m*	*fn*	*b*
Hex	1D	28	43	*pL*	*pH*	*m*	*fn*	*b*
Decimal	29	40	67	*pL*	*pH*	*m*	*fn*	*b*

[Range] (*pL* + *pH* × 256) = 3 (*pL* = 3, *pH* = 0)

m = 0

b = 0

[Description] Transmit the number of bytes of remaining memory (unused area) in the NV user memory.

	Hexadecimal	Decimal	Amount of Data
Header	37H	55	1 byte
Flag	29H	41	1 byte
Number of Bytes of Remaining Memory	30H - 39H	48 - 57	1 - 6 bytes
NUL	00H	0	1 byte

3.2.4 Control Command - continue

GS (C *pL pH m fn b* (*fn* = 5, 53) **Function 5**

[Format]

ASCII	GS	(	C	*pL*	*pH*	*m*	*fn*	*b*
Hex	1D	28	43	*pL*	*pH*	*m*	*fn*	*b*
Decimal	29	40	67	*pL*	*pH*	*m*	*fn*	*b*

[Range] $(pL + pH \times 256) = 3$ ($pL = 3$, $pH = 0$)

$m = 0$ $b = 0$

[Description] Transmit the key code list identifying the stored record.

	Hexadecimal	Decimal	Amount of Data
Header	37H	55	1 byte
Flag	71H	113	1 byte
Status	40H or 41H	64 or 65	1 byte
Data	20H - FEH	32 - 254	2 - 80 bytes
NUL	00H	0	1 byte

Data consist of the data groups identified with key codes.

If the specified record cannot be detected, the contents of the transmitted data are as follows:

	Hexadecimal	Decimal	Amount of Data
Header	37H	55	1 byte
Flag	71H	113	1 byte
Status	40H	64	1 byte
NUL	00H	0	1 byte

After the [Header - NUL] is transmitted, the printer receives a response from the host: Then it performs the process defined by the response (See the tables below). When the status (existence of the next data block) is Hexadecimal = 41H / Decimal = 65

Response		Process Performed
ASCII	**Decimal**	
ACK	6	Transmits the next data
NAK	21	Transmits the previous data again
CAN	24	Ends the process

When the status (existence of the next data block) is Hexadecimal = 40H / Decimal = 64

Response		Process Performed
ASCII	**Decimal**	
ACK	6	Ends the process
NAK	21	Transmits the previous data again
CAN	24	Cancels the process

3.2.4 Control Command - continue

GS (C *pL pH m fn b d1 d2 d3* (*fn* = 6, 54) **Function 6**

[Format]	ASCII	GS	(	C	*pL*	*pH*	*m*	*fn*	*b*	*d1*	*d2*	*d3*
	Hex	1D	28	43	*pL*	*pH*	*m*	*fn*	*b*	*d1*	*d2*	*d3*
	Decimal	29	40	67	*pL*	*pH*	*m*	*fn*	*b*	*d1*	*d2*	*d3*

[Range] (*pL* + *pH* × 256) = 6 (*pL* = 6, *pH* = 0)

m = 0 *d1* = 67

b = 0 *d2* = 76

d3 = 82

[Description] Delete all data in the NV user memory.

GS (D *pL pH m [a1 b1]...[ak bk]*

[Name] Enable/disable real-time command

[Format]	ASCII	GS	(	D	*pL*	*pH*	*m*	*[a1 b1]...[ak bk]*
	Hex	1D	28	44	*pL*	*pH*	*m*	*[a1 b1]...[ak bk]*
	Decimal	29	40	68	*pL*	*pH*	*m*	*[a1 b1]...[ak bk]*

[Range] 3 ≤ (*pL* + *pH* × 256) ≤ 65535

m = 20

a = 1, 2

b = 0, 1, 48, 49

[Default]

a	Type(s) of Real-Time Commands	Default
1	**DLE DC4 *fn m t*** (*fn*= 1) : Generate pulse in real time	Enabled (*b*= 1)
2	**DLE DC4 *fn a b*** (*fn*= 2) : Execute power-off sequence	Disabled (*b*= 0)

[Description] Enable or disable the following real-time commands.

a	*b*	Function	
1	0, 48	**DLE DC4 *fn m t***	(*fn* = 1) : Not processed (disabled)
	1, 49	**DLE DC4 *fn m t***	(*fn* = 1) : Processed (enabled)
2	0, 48	**DLE DC4 *fn a b***	(*fn* = 2) : Not processed (disabled)
	1, 49	**DLE DC4 *fn a b***	(*fn* = 2) : Processed (enabled)

- *pL, pH* specify (*pL*+ *pH* × 256) as the number of bytes after *pH* (*m* and *[a1 b1]…[ak bk]*).
- *a* specify the type of real-time command.
- *b* specify enabled or disabled.

3.2.4 Control Command - continue

GS (E *pL pH fn [parameter]*

[Name] User setup commands

[Description] Customize the NV user memory area. The table below explains the functions available in this command.

Execute commands related to the user setting mode by specifying the function code *fn*.

fn	Format	No.	Function
1	**GS (E *pL pH fn d1 d2***	1	Changes into the user setting mode
2	**GS (E *pL pH fn d1 d2 d3***	2	Ends the user setting mode session. (Performs a soft reset.)
3	**GS (E *pL pH fn [a1 b18...b11]… [ak bk8...bk1]***	3	Sets value(s) for the memory switch.
4	**GS (E *pL pH fn a***	4	Transmits the settings of the memory switch to the host.
5	**GS (E *pL pH fn [a1 n1L n1H]… [ak nkL nkH]***	5	Sets the customized value(s).
6	**GS (E *pL pH fn a***	6	Transmits the customized value settings.
7	**GS (E *pL pH fn a d1 d2***	7	Copies the user-defined page.
8	**GS (E *pL pH fn y c1 c2 [x d1… d(y × x)]k***	8	Defines data in column format for the character code page in the active area.
9	**GS (E *pL pH fn x c1 c2 [y d1… d(y × x)]k***	9	Defines data in raster format for the character code page in the active area.
10	**GS (E *pL pH fn c1 c2***	10	Deletes the data in the character code page in the active area.
11	**-**	-	-
12	**GS (E *pL pH fn a***	12	Transmits the communication conditions for the serial interface.

- *pL, pH* specify (*pL* + *pH* × 256) as the number of bytes after *pH* (*fn* and *[parameter]*).
- The user setting mode is a special mode to change the values in the NV user memory with this command.
- In Function 2, the printer performs software reset. Therefore, the printer clears the receive and print buffers, and resets all settings (user-defined characters, macros, and the character style) to the mode in effect at power on.
- The customized values can be ascertained with Function 4, 6, or 12, even though the printer does not enter the user setting mode.

3.2.4 Control Command - continue

GS (E *pL pH fn d1 d2* (*fn* = 1) Function 1

[Format]

ASCII	GS	(	E	*pL*	*pH*	*fn*	*d1*	*d2*
Hex	1D	28	45	*pL*	*pH*	*fn*	*d1*	*d2*
Decimal	29	40	69	*pL*	*pH*	*fn*	*d1*	*d2*

[Range] (*pL* + *pH* × 256) = 3 (*pL* = 3, *pH* = 0)

d1 = 73 *d2* = 78

[Description] Enter the user setting mode and notifies the host that the mode has changed.

	Hexadecimal	Decimal	Amount of Data
Header	37H	55	1 byte
Flag	20H	32	1 byte
NUL	00H	0	1 byte

• The following commands are enabled in the user setting mode. Function 2 through Function 12 of GS (E, GS I

GS (E *pL pH fn d1 d2 d3* (*fn* = 2) Function 2

[Format]

ASCII	GS	(	E	*pL*	*pH*	*fn*	*d1*	*d2*	*d3*
Hex	1D	28	45	*pL*	*pH*	*fn*	*d1*	*d2*	*d3*
Decimal	29	40	69	*pL*	*pH*	*fn*	*d1*	*d2*	*d3*

[Range] (*pL* + *pH* × 256) = 4 (*pL* = 4 , *pH* = 0)

d1 = 79 *d2* = 85 *d3* = 84

[Description] End the user setting mode and performs a software reset. Therefore, the printer clear the receive and print buffers, and reset all settings (user-defined characters, downloaded bit images, macros, and the character style) to the mode that was in effect at power on. This function code (*fn* = 2) is enabled only in the user setting mode.

GS (E *pL pH fn [a1 b18...b11]...[ak bk8...bk1]* (*fn* = 3) Function 3

[Format]

ASCII	GS	(	E	*pL*	*pH*	*fn*	*[a1 b18 ... b11] ... [ak bk8 ... bk1]*
Hex	1D	28	45	*pL*	*pH*	*fn*	*[a1 b18 ... b11] ... [ak bk8 ... bk1]*
Decimal	29	40	69	*pL*	*pH*	*fn*	*[a1 b18 ... b11] ... [ak bk8 ... bk1]*

[Range] 10 ≤ (*pL* + *pH* × 256) ≤ 65535

a = 1

b = 48, 49, 50

[Default] All setting value Off (*b* = 48)

[Description] Changes printer setting value specified by to the values specified by *b.*

- When *b* = 48, the applicable bit is turned to off.
- When *b* = 49, the applicable bit is turned to on.
- When *b* = 50, the applicable bit is not changed.

3.2.4 Control Command - continue

GS (E *pL pH fn [a1 b18...b11]...[ak bk8...bk1]* (*fn* = 3) **Function 3** - continue

When *a* =1 as follows:

Bit	Setting Value	Function
1	48	Does not transmit the power ON information.
	49	Transmits the power ON information.
2	50	Reserved.
3	50	Reserved.
4	50	Reserved.
5	50	Reserved.
6	50	Reserved.
7	50	Reserved.
8	50	Reserved.

The power on information consists of the data as follows:

	Hexadecimal	Decimal	Amount of Data
Header	3BH	59	1 byte
Flag	31H	49	1 byte
NUL	00H	0	1 byte

• This function code (*fn* = 3) is enabled only in the user setting mode.

GS (E *pL pH fn a* (*fn* = 4) **Function 4**

[Format]

ASCII	GS	(	E	*pL*	*pH*	*fn*	*a*
Hex	1D	28	45	*pL*	*pH*	*fn*	*a*
Decimal	29	40	69	*pL*	*pH*	*fn*	*a*

[Range] (*pL* + *pH* × 256) = 2 (*pL* = 2, *pH* = 0)

a = 1, 2

[Description] Transmit the setting value(s) of the memory dip switch specified by a.

	Hexadecimal	Decimal	Amount of Data
Header	37H	55	1 byte
Flag	21H	33	1 byte
Data	30H or 31H	48 or 49	8 bytes
NUL	00H	0	1 byte

Data for the setting is transmitted as 8 bytes or a data string in the order from bit 8 to bit 1, as follows:

• OFF: Hexadecimal = 30H / Decimal = 48

• ON: Hexadecimal = 31H / Decimal = 49

3.2.4 Control Command - continue

GS (E *pL pH fn [a1 n1L n1H]...[ak nkL nkH]* (*fn* = 5) **Function 5**

[Format]

ASCII	GS	(	E	*pL*	*pH*	*fn*	*[a1 n1L n1H] ... [ak nkL nkH]*
Hex	1D	28	45	*pL*	*pH*	*fn*	*[a1 n1L n1H] ... [ak nkL nkH]*
Decimal	29	40	69	*pL*	*pH*	*fn*	*[a1 n1L n1H] ... [ak nkL nkH]*

[Range] $4 \le (pL + pH \times 256) \le 65535$ $a = 5, 97, 116, 118$

$1 \le (nL + nH \times 256) \le 65535$ $1 \le a \le 3$

[Default] • When $a = 1$: $(nL + nH \times 256) = 1$ • When $a = 2$: $(nL + nH \times 256) = 7$ • When $a = 3$: (nL + nH × 256) = 6

• When $a = 116$: $(nL + nH \times 256) = 1$ • When $a = 118$: $(nL + nH \times 256) = 85$

[Description] Change the setting of the customized value that is specified with *a* as $(nL + nH \times 256)$.

a	Function
1	Specify the capacity of the NV user memory.
2	Specify the capacity of the NV graphics memory.
3	Select the paper width.
116	Select the type of paper (single-color or two-color).
118	Select the black-color density in two-color printing.

When *a* = 1, the capacity of the NV user memory is selected as the size specified with $(nL + nH \times 256)$.

Value of (*nL*+ *nH* × 256)	Memory Size
1	64KB
2	128KB
3	192KB
4	256KB
5	320KB

When *a* = 2, the capacity of the NV graphics memory is selected as the size specified with $(nL + nH \times 256)$.

Value of (*nL*+ *nH* × 256)	Memory Size
1	None
2	64KB
3	128KB
4	192KB
5	256KB
6	320KB
7	384KB

3.2.4 Control Command - continue

GS (E *pL pH fn [a1 n1L n1H]...[ak nkL nkH]* (*fn* = 5) **Function 5** - continue

The combination that can be specified for the NV user memory capacity and the NV bit image capacity are as shown in the table below.

Even if the printer receives an impossible combination, the printer automatically set a possible combination for each memory size.

Memory Size of NV User Memory	Memory Size of NV Bit Image Memory
64KB	384KB or less
128KB	256KB or less
192KB	128KB or less
256KB	0

When *a* = 3, the paper width is selected as the size specified with (*nL* + *nH* × 256).

Value of (*nL*+ *nH* × 256)	Paper Width
2	58 mm
6	80 mm

When *a* = 116, the paper is selected as the paper specified with (*nL* + *nH* × 256).

Value of (*nL*+ *nH* × 256)	Paper
1	Specified single-color paper
257	Recommended two-color paper

When *a* = 118, the black-color density is selected as the number specified with (*nL* + *nH* × 256).

(*nL*+ *nH* × 256)	Black-Color Density
70	Light
85	Medium
100	Dark

Adjustment of black-color density:

- The black-color density is affected only in two-color printing. This is not affected for single-color printing.

The values changed with this command become effective with the following:

- Execution of [Function 2] of this command (recommended)
- Turning the power on again

When paper width set 58mm, default printing condition will be change below :

- Print speed set 150mm/sec

3.2.4 Control Command - continue

GS (E *pL pH fn a* (*fn* = 6) **Function 6**

[Format]

ASCII	GS	(	E	*pL*	*pH*	*fn*	*a*
Hex	1D	28	45	*pL*	*pH*	*fn*	*a*
Decimal	29	40	69	*pL*	*pH*	*fn*	*a*

[Range] ($pL + pH \times 256$) = 2 (*pL* = 2, *pH* = 0)

$1 \le a \le 3$

a = 116, 118

[Description] Transmit the customized value corresponding to the number specified by *a*.

	Hexadecimal	Decimal	Amount of Data
Header	37H	55	1 byte
Flag	27H	39	1 byte
Customized Value Number	30H – 39H	48 – 57	1 – 3 bytes
Separator	1FH	31	1 byte
Customized Value	30H – 39H	48 – 57	1 – 5 bytes
NUL	00H	0	1 byte

The customized value number is as follows:

a	Transmission Data		
	1st Byte	2nd Byte	3rd Byte
1	49	--	--
2	50	--	--
3	51	--	--
116	49	49	54
118	49	49	56

Configuration of the customized value When the NV user memory capacity (*a* = 1) is specified:

Setting Status		Transmission Data				
Data to be Stored	Memory Capacity	1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte
1	64KB	49	--	--	--	--
2	128KB	50	--	--	--	--
3	192KB	51	--	--	--	--
4	256KB	52	--	--	--	--
5	320KB	53	--	--	--	--

3.2.4 Control Command - continue

GS (E *pL pH fn a* (*fn* = 6) **Function 6** - continue

When the NV graphics memory capacity (*a* = 2) is specified:

Setting Status		Transmission Data				
Data to be Stored	**Memory Capacity**	**1st Byte**	**2nd Byte**	**3rd Byte**	**4th Byte**	**5th Byte**
1	None	49	--	--	--	--
2	64KB	50	--	--	--	--
3	128KB	51	--	--	--	--
4	192KB	52	--	--	--	--
5	256KB	53	--	--	--	--
6	320KB	54	--	--	--	--
7	384KB	55	--	--	--	--

When the paper width (*a* = 3) is specified:

Setting Status		Transmission Data				
Data to be Stored	**Print Density**	**1st Byte**	**2nd Byte**	**3rd Byte**	**4th Byte**	**5th Byte**
2	58 mm	50	--	--	--	--
6	80 mm	54	--	--	--	--

When the type of paper (*a* = 116) is specified:

Setting Status		Transmission Data				
Data to be Stored	**Print Control Method**	**1st Byte**	**2nd Byte**	**3rd Byte**	**4th Byte**	**5th Byte**
1	Single-color paper	49	--	--	--	--
257	Two-color paper	50	53	55	--	--

When black-color density (*a* = 118) is specified for two-color:

Setting Status		Transmission Data		
Data to be Stored	**Black-Color Density**	**1st Byte**	**2nd Byte**	**3rd Byte**
70	Light	55	48	--
85	Medium	56	53	--
100	Dark	49	48	48

3.2.4 Control Command - continue

GS (E *pL pH fn a d1 d2* (*fn* = 7) **Function 7**

[Format]	ASCII	GS	(	E	*pL*	*pH*	*fn*	*a*	*d1*	*d2*
	Hex	1D	28	45	*pL*	*pH*	*fn*	*a*	*d1*	*d2*
	Decimal	29	40	69	*pL*	*pH*	*fn*	*a*	*d1*	*d2*

[Range] (*pL* + *pH* × 256) = 4 (*pL* = 4, *pH* = 0)

a = 10, 12, 17, 18

[Description] Copy the data on the user-defined code page specified with *a*.

Font No.	Font Type	Data Configuration	
		Number of Dots in Horizontal Direction	Number of Dots in Vertical Direction
10	9 ×17	9	17
12	12 ×24	12	24

d1	*d2*	Function
31	30	Load the character code page data of the font specified with *a* in the storage area to the active area.
30	31	Save the character code page data in the active area to the storage area specified by the font specified with *a*.

- Active area: Volatile memory (RAM)
- Storage area: Non-volatile memory (Flash ROM)
- User-defined code page: Page 255 (space page)

This function code *fn* = 7 is enabled only in the user setting mode.

3.2.4 Control Command - continue

GS (E *pL pH fn y c1 c2 [x d1 … d(y × x)]k* (*fn* = 8) **Function 8**

[Format]	ASCII	GS	(	E	*pL*	*pH*	*fn*	*y*	*c1*	*c2*	*[x d1...d(y × x)]k*
	Hex	1D	28	45	*pL*	*pH*	*fn*	*y*	*c1*	*c2*	*[x d1...d(y × x)]k*
	Decimal	29	40	69	*pL*	*pH*	*fn*	*y*	*c1*	*c2*	*[x d1...d(y × x)]k*

[Range] $5 \le (pL + pH \times 256) \le 65535$

$128 \le c1 \le c2 \le 255$ $0 \le d \le 255$

$y = 3$ $0 \le x \le 12$ (when font A (12 × 24) is selected)

$0 \le x \le 9$ (when font B (9 × 17) is selected)

$k = c2 - c1 + 1$

[Description] Define the data for each character on the character code page in the active area (RAM).

The character pattern is defined as the column type. This function code *fn* = 8 is enabled in the user setting mode.

The data configuration is as follows: (Example: 9 dots horizontally × 17 dots vertically)

Bit	d1 d3	d4 d6	d7 d9	d10 d12	d13 d15	d16 d18	d19 d21	d22 d24	d25 d27
7	○	○	○	○	○	○	○	○	○
6	○	○	●	●	○	○	○	○	○
5	○	○	●	●	○	○	○	○	○
4	○	○	●	●	○	○	○	○	○
3	○	○	●	●	○	○	○	○	○
2	○	●	●	●	●	○	○	○	○
1	○	●	○	○	●	○	○	○	○
0	○	●	○	○	●	○	○	○	○
7	○	●	○	○	●	○	○	○	○
6	○	●	●	●	●	○	○	○	○
5	○	●	○	○	●	○	○	○	○
4	●	●	○	○	●	●	○	○	○
3	●	○	○	○	○	●	○	○	○
2	●	○	○	○	○	●	○	○	○
1	●	○	○	○	○	●	○	○	○
0	●	○	○	○	○	●	○	○	○
7	●	○	○	○	○	●	○	○	○
6	○	○	○	○	○	○	○	○	○
5	○	○	○	○	○	○	○	○	○
4	●	●	●	●	●	●	○	○	○
3	○	○	○	○	○	○	○	○	○
2	○	○	○	○	○	○	○	○	○
1	○	○	○	○	○	○	○	○	○
0	○	○	○	○	○	○	○	○	○

← Only Bit7 is printed.
Even if 1 is specified
for any Bit from 6 to 0,
it is not printed

3.2.4 Control Command - continue

GS (E *pL pH fn x c1 c2 [y d1...d(x × y)]k* (*fn* = 9) **Function 9**

[Format]	ASCII	GS	(	E	*pL*	*pH*	*fn*	*x*	*c1*	*c2*	*[y d1...d(x × y)]k*
	Hex	1D	28	45	*pL*	*pH*	*fn*	*x*	*c1*	*c2*	*[y d1...d(x × y]k*
	Decimal	29	40	69	*pL*	*pH*	*fn*	*x*	*c1*	*c2*	*[y d1...d(x × y)k*

[Range] $5 \le (pL + pH \times 256) \le 65535$

$128 \le c1 \le c2 \le 255$ $0 \le d \le 255$

$x = 2$ $0 \le y \le 24$ (when font A (12 × 24) is selected)

$0 \le y \le 17$ (when font B (9 × 17) is selected)

$k = c2 - c1 + 1$

[Description] Define the data for each character on the character code page in the active area (RAM).

The character pattern is defined as the raster type. This function code *fn* = 9 is enabled only in the user setting mode.

The data configuration is as follows: (Example: 12 dots horizontally × 24 dots vertically)

	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
d1	d2	○	○	○	○	○	○	○	●	○	○	○	○	○	○	●	○
d3	d4	○	○	○	○	○	○	●	●	○	○	○	○	○	●	○	○
d5	d6	○	○	○	○	○	●	○	●	○	○	○	○	○	●	●	○
d7	d8	○	○	○	○	○	●	●	●	○	○	○	○	●	○	○	○
d9	d10	○	○	○	○	●	○	○	●	○	○	○	○	●	○	●	○
d11	d12	○	○	○	○	●	○	●	●	○	○	○	○	●	●	○	○
d13	d14	○	○	○	○	○	○	○	●	○	○	○	○	○	○	●	○
d15	d16	○	○	○	○	○	○	●	●	○	○	○	○	○	●	○	○
d17	d18	○	○	○	○	○	●	○	●	○	○	○	○	○	●	●	○
d19	d20	○	○	○	○	○	●	●	●	○	○	○	○	●	○	○	○
d21	d22	○	○	○	○	●	○	○	●	○	○	○	○	●	○	●	○
d23	d24	○	○	○	○	●	○	●	●	○	○	○	○	●	●	○	○
d25	d26	○	○	○	○	○	○	○	●	○	○	○	○	○	○	●	○
d27	d28	○	○	○	○	○	○	●	●	○	○	○	○	○	●	○	○
d29	d30	○	○	○	○	○	●	○	●	○	○	○	○	○	●	●	○
d31	d32	○	○	○	○	○	●	●	●	○	○	○	○	●	○	○	○
d33	d34	○	○	○	○	●	○	○	●	○	○	○	○	●	○	●	○
d35	d36	○	○	○	○	●	○	●	●	○	○	○	○	●	●	○	○
d37	d38	○	○	○	○	○	○	○	●	○	○	○	○	○	○	●	○
d39	d40	○	○	○	○	○	○	●	●	○	○	○	○	○	●	○	○
d41	d42	○	○	○	○	○	●	○	●	○	○	○	○	○	●	●	○
d43	d44	○	○	○	○	○	●	●	●	○	○	○	○	●	○	○	○
d45	d46	○	○	○	○	●	○	○	●	○	○	○	○	●	○	●	○
d47	d48	○	○	○	○	●	○	●	●	○	○	○	○	●	●	○	○

← All dots in odd bytes are printed. Bits 7 through 4 in even dots are printed. Even if 1 is specified for any bit from 3 to 0, it is not printed

3.2.4 Control Command - continue

GS (E *pL pH fn c1 c2* (*fn* = 10) Function 10

[Format]	ASCII	GS	(	E	*pL*	*pH*	*fn*	*c1*	*c2*
	Hex	1D	28	45	*pL*	*pH*	*fn*	*c1*	*c2*
	Decimal	29	40	69	*pL*	*pH*	*fn*	*c1*	*c2*

[Range] (*pL* + *pH* × 256) = 3 (*pL* = 3, *pH* = 0)

128 ≤ *c1* ≤ *c2* ≤ 255

[Description] Delete the data for each character in the character code page in the active area (RAM).

After deleting the data, space patterns (no printing) are given.

This function code *fn* = 10 is enabled only in the user setting mode.

GS (E *pL pH fn a* (*fn* = 12) Function 12

[Format]	ASCII	GS	(	E	*pL*	*pH*	*fn*	*a*
	Hex	1D	28	45	*pL*	*pH*	*fn*	*a*
	Decimal	29	40	69	*pL*	*pH*	*fn*	*a*

[Range] (*pL* + *pH* × 256) = 2 (*pL* = 2, *pH* = 0)

1 ≤ *a* ≤ 4

[Description] Transmit the communication conditions of the serial interface specified by *a*.

a	Communication Conditions
1	Baud rate
2	Parity
3	Handshake control
4	Data length

	Hexadecimal	Decimal	Amount of Data
Header	37H	55	1 byte
Flag	33H	39	1 byte
Type of Communication Condition	31H-34H	49-52	1 byte
Separator	1FH	31	1 byte
Setting Value	30H-39H	48-39	1 – 6 byte
NUL	00H	0	1 byte

Configuration of the setting value

3.2.4 Control Command - continue

GS (E *pL pH fn a* (*fn* = 12) **Function 12** - continue

When the baud rate (*a* = 1) is specified:

Baud Rate (bps)	*d1*	*d2*	*d3*	*d4*	*d5*	*d6*
2400	50	52	48	48	--	--
4800	52	56	48	48	--	--
9600	57	54	48	48	--	--
19200	49	57	50	48	48	--
38400	51	56	52	48	48	--
57600	53	55	54	48	48	--
115200	49	49	53	50	48	48

When the parity setting (*a* = 2) is specified:

Parity	*d1*
No parity	48
Odd parity	49
Even parity	50

When the handshake control (*a* = 3) is specified:

Parity	*d1*
DSR / DTR	48
XON / XOFF	49

When the data length (*a* = 4) is specified:

Data Length	*d1*
7 bits	55
8 bits	56

If is out of range, this command ignores the value specified with *a*.

GS (K *pL pH fn m*

[Name] Print control method(s)

[Description] Set the print control specified by *fn*.

fn	Function
48	Specify the print control mode.

3.2.4 Control Command - continue

GS (K *pL pH fn m* (*fn* = 48) **Function 48**

[Format]								
	ASCII	GS	(	K	*pL*	*pH*	*fn*	*m*
	Hex	1D	28	4B	*pL*	*pH*	*fn*	*m*
	Decimal	29	40	75	*pL*	*pH*	*fn*	*m*

[Range] (*pL* + *pH* × 256) = 2 (*pL* = 2, *pH* = 0)

1 ≤ *m* ≤ 4

49 ≤ *m* ≤ 52

[Default] *m* = 1

[Description] Select the print control mode.

m	Print Control Mode
1, 49	Select print control mode 1 (standard).
2, 50	Select print control mode 2 (fence bar code).
3, 51	Select print control mode 3 (ladder bar code).
4, 52	Select print control mode 4 (2-dimensional code).

① GS (L *pL pH m fn [parameters]*

② GS 8 L *p1 p2 p3 p4 m fn [parameters]*

[Name] Select graphics data

[Format]											
	① ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*	*[parameters]*		
	Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*	*[parameters]*		
	Decimal	29	40	76	*pL*	*pH*	*m*	*fn*	*[parameters]*		
	② ASCII	GS	8	L	*p1*	*p2*	*p3*	*p4*	*m*	*fn*	*[parameters]*
	Hex	1D	38	4C	*p1*	*p2*	*p3*	*p4*	*m*	*fn*	*[parameters]*
	Decimal	29	56	76	*p1*	*p2*	*p3*	*p4*	*m*	*fn*	*[parameters]*

In the description below **GS (L** is used for explanation.

Note that **GS (L** and **GS 8 L** have the same function.

If the *[parameters]* of each format exceeds 65535 bytes use **GS 8 L**.

3.2.4 Control Command - continue

① GS (L *pL pH m fn [parameters]*

② GS 8 L *p1 p2 p3 p4 m fn [parameters]* - continue

[Description] Process graphics data according to the function code *fn*.

fn	Format	No.	Function
0, 48	**GS (L *pL pH m fn***	48	Transmits the NV graphics memory capacity.
2, 50	**GS (L *pL pH m fn***	50	Prints the graphics data in the print buffer.
3, 51	**GS (L *pL pH m fn***	51	Transmits the remaining capacity of the NV graphics memory.
64	**GS (L *pL pH m fn d1 d2***	64	Transmits the defined NV graphics key code list.
65	**GS (L *pL pH m fn d1 d2 d3***	65	Deletes all NV graphics data.
66	**GS (L *pL pH m fn kc1 kc2***	66	Deletes the specified NV graphics data.
67	**GS (L *pL pH m fn a kc1 kc2 b xL xH yL yH [c d1...dk]1...[c d1...dk]b***	67	Defines the raster graphics data in the non-volatile memory.
69	**GS (L *pL pH m fn kc1 kc2 x y***	69	Prints the specified NV graphics data.
112	**GS (L *pL pH m fn a bx by c xL xH yL yH d1...dk***	112	Stores the raster graphics data in the print buffer memory.

• *pL, pH* specify (*pL* + *pH* × 256) as the number of bytes after *pH* or *p4* (*m, fn*, and *[parameter]*).

GS (L *pL pH m fn* (*fn* = 0, 48) **Function 48**

[Format]

ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*
Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*
Decimal	29	40	76	*pL*	*pH*	*m*	*fn*

[Range] (*pL* + *pH* × 256) = 2 (*pL* = 2, *pH* = 0)

m = 48

[Description] Transmit the total capacity of the NV graphics memory (number of bytes in the memory area).

	Hexadecimal	Decimal	Amount of Data
Header	37H	55	1 byte
Flag	30H	48	1 byte
Data	30H – 39H	48 – 57	1 – 8 bytes
NUL	00H	0	1 byte

• The data describing total capacity is converted to character codes corresponding to decimal data, then transmitted from the MSB.

• The data length is variable.

• The total capacity of the NV user memory is selectable as any one of these:

[0, 64K, 128K, 192K, 256K, 320K, 384K] bytes with **GS (E**. The default value is 384KB.

3.2.4 Control Command - continue

GS (L *pL pH m fn* (*fn* = 2, 50) **Function 50**

[Format]	ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*
	Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*
	Decimal	29	40	76	*pL*	*pH*	*m*	*fn*

[Range] (*pL* + *pH* × 256) = 2 (*pL* = 2, *pH* = 0)

m = 48

[Description] Print the buffered graphics stored by the process of Function 112.

Feed paper by the amount corresponding to the number of dots in the *y* direction of the buffered graphics.

GS (L *pL pH m fn* (*fn* = 3, 51) **Function 3,51**

[Format]	ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*
	Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*
	Decimal	29	40	76	*pL*	*pH*	*m*	*fn*

[Range] (*pL* + *pH* × 256) = 2 (*pL* = 2, *pH* = 0)

m = 48

[Description] Transmit the number of bytes of remaining memory (unused area) in the NV graphics memory.

	Hexadecimal	Decimal	Amount of Data
Header	37H	55	1 byte
Flag	31H	49	1 byte
Data	30H – 39H	48 – 57	1 – 8 bytes
NUL	00H	0	1 byte

The number of bytes of remaining memory is converted to character codes corresponding to decimal data, and then transmitted from the MSB. The data length is variable.

GS (L *pL pH m fn d1 d2* (*fn* = 64) **Function 64**

[Format]	ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*	*d1*	*d2*
	Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*	*d1*	*d2*
	Decimal	29	40	76	*pL*	*pH*	*m*	*fn*	*d1*	*d2*

[Range] (*pL* + *pH* × 256) = 4 (*pL* = 4, *pH* = 0)

m = 48

d1 = 75

d2 = 67

3.2.4 Control Command - continue

GS (L *pL pH m fn d1 d2* (*fn* = 64) **Function 64** - continue

[Description] Transmit the defined NV graphics key code list. When the key code is present:

	Hexadecimal	Decimal	Amount of Data
Header	37H	55	1 byte
Flag	72H	114	1 byte
Status	40H or 41H	64 or 65	1 byte
Data	30H – 39H	48 – 57	2 – 80 bytes
NUL	00H	0	1 byte

When the key code is not present:

	Hexadecimal	Decimal	Amount of Data
Header	37H	55	1 byte
Flag	72H	114	1 byte
Status	40H	64	1 byte
NUL	00H	0	1 byte

If the number of the key code exceeds 40, divide the key code by 40 for transmission.

- The status if the continuous transmission data block is present is 41H.
- The status if the continuous transmission data block is not present is 40H.

After the [Header–NUL] is transmitted, the printer receives a response from the host, then it performs the process defined by the response (See the tables below).

When the status (existence of the next data block) is Hexadecimal = 41H / Decimal = 65

Response		Process Performed
ASCII	**Decimal**	
ACK	6	Transmits the next data.
NAK	21	Transmits the previous data again.
CAN	24	Ends the process.

When the status (for the last data block) is Hexadecimal = 40H / Decimal = 64

Response		Process Performed
ASCII	**Decimal**	
ACK	6	Ends the process.
NAK	21	Transmits the previous data again.
CAN	24	Cancels the process.

3.2.4 Control Command - continue

GS (L *pL pH m fn d1 d2 d3* (*fn* = 65) **Function 65**

[Format]	ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*	*d1*	*d2*	*d3*
	Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*	*d1*	*d2*	*d3*
	Decimal	29	40	76	*pL*	*pH*	*m*	*fn*	*d1*	*d2*	*d3*

[Range] (*pL* + *pH* × 256) = 5 (*pL* = 5, *pH* = 0)

m = 48 *d1* = 67 *d2* = 76 *d3* = 82

[Description] Delete all defined NV graphics data.

GS (L *pL pH m fn kc1 kc2* (*fn* = 66) **Function 66**

[Format]	ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*	*kc1*	*kc2*
	Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*	*kc1*	*kc2*
	Decimal	29	40	76	*pL*	*pH*	*m*	*fn*	*kc1*	*kc2*

[Range] (*pL* + *pH* × 256) = 4 (*pL* = 4, *pH* = 0)

m = 48 32 ≤ *kc1* ≤ 126

32 ≤ *kc2* ≤ 126

[Description] Delete the NV graphics data defined by the key codes *kc1* and *kc2*.

GS (L *pL pH m fn a kc1 kc2 b xL xH yL yH [c d1....dk]1… [c d1....dk]b* (*fn* = 67) **Function 67**

Format]	ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*	*a*	*kc1*	*kc2*
		b	*xL*	*xH*	*yL*	*yH*	*c*	*d1...dk*			
	Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*	*a*	*kc1*	*kc2*
		b	*xL*	*xH*	*yL*	*yH*	*c*	*d1...dk*			
	Decimal	29	40	76	*pL*	*pH*	*m*	*fn*	*a*	*kc1*	*kc2*
		b	*xL*	*xH*	*yL*	*yH*	*c*	*d1...dk*			

[Range] 12 ≤ (*pL* + *pH* × 256) ≤ 65535 (0 ≤ *pL* ≤ 255, 0 ≤ *pH* ≤ 255)

m = 48

a = 48 32 ≤ *kc1* ≤ 126

b = 1 32 ≤ *kc2* ≤ 126

c = 49 1 ≤ (*xL* + *xH* × 256) ≤ 8192

0 ≤ *d* ≤ 255 1 ≤ (*yL* + *yH* × 256) ≤ 2304

k = (int ((*xL* + *xH* × 256) + 7) / 8) × (*yL* + *yH* × 256)

The total capacity of the NV user memory is selectable as any one of these:

[0, 64K, 128K, 192K, 256K, 320K, 384K] bytes with **GS (E**. The default value is 384KB.

[Description] Define the raster graphics data in the NV graphics area. *b* specifies the number of the color of the defined data.

- *xL, xH* specify the defined data in the horizontal direction as (*xL* + *xH* × 256) dots.
- *yL, yH* specify the defined data in the vertical direction as (*yL* + *yH* × 256) dots.

3.2.4 Control Command - continue

GS (L *pL pH m fn kc1 kc2 x y* (*fn* = 69) **Function 69**

[Format]	ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*	*kc1*	*kc2*	*x*	*y*
	Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*	*kc1*	*kc2*	*x*	*y*
	Decimal	29	40	76	*pL*	*pH*	*m*	*fn*	*kc1*	*kc2*	*x*	*y*

[Range] (*pL* + *pH* × 256) = 6 (*pL* = 6, *pH* = 0)

m = 48

x = 1,2

y = 1,2

32 ≤ *kc1* ≤ 126

32 ≤ *kc2* ≤ 126

[Description] Print the NV graphics data defined by the key codes *kc1* and *kc2*.

The graphics data is enlarged by *x* and *y* in the horizontal and vertical directions.

GS (L *pL pH m fn a bx by c xL xH yL yH d1...dk* (*fn* = 112) **Function 112**

[Format]	ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*	*a*	*bx*	*by*
		c	*xL*	*xH*	*yL*	*yH*	*d1... dk*				
	Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*	*a*	*bx*	*by*
		c	*xL*	*xH*	*yL*	*yH*	*d1...dk*				
	Decimal	29	40	76	*pL*	*pH*	*m*	*fn*	*a*	*bx*	*by*
		c	*xL*	*xH*	*yL*	*yH*	*d1...dk*				

[Range] 11 ≤ (*pL* + *pH* × 256) ≤ 65535

(0 ≤ *pL* ≤ 255, 0 ≤ *pH* ≤ 255)

m = 48

a = 48 *bx* = 1, 2

c = 49 *by* = 1, 2

1 ≤ (*xL* + *xH* × 256) ≤ 1024

1 ≤ (*yL* + *yH* × 256) ≤ 1662 (when *by* = 1)

1 ≤ (*yL* + *yH* × 256) ≤ 831 (when *by* = 2)

0 ≤ *d* ≤ 255

k = (int ((*xL* + *xH* × 256) + 7) / 8) × (*yL* + *yH* × 256)

[Description] Store the raster graphics data, enlarged *bx* and *by* in the horizontal and vertical directions in the print buffer.

- *xL, xH* specify the raster graphics data in the horizontal direction as (*xL* + *xH* × 256) dots.
- *yL, yH* specify the raster graphics data in the vertical direction as (*yL* + *yH* × 256) dots.

3.2.4 Control Command - continue

GS (M *pL pH fn m*

[Name] Customize printer

[Description] Protects or recovers values or data set or defined in the active area by commands.

fn	Function No.	Description
1, 49	Function 1	Copies the setting stored in the active area to the storage area (save settings).
2, 50	Function 2	Copies the setting stored in the storage area to the active area (load settings).
3, 51	Function 3	Enable or disable automatic loading of the setting upon initialization.

- Active area: Volatile memory (RAM)
- Storage area: Non-volatile memory (Flash ROM)

Lists of command that is affect by this command.

Setting Value		Command
Status		**ESC c 3, GS a**
Defined data		**GS :**
Characters	Kind of character	**ESC M, ESC R, ESC t**
	Style	**ESC !, ESC –, ESC E, ESC G, ESC V, ESC {, GS !, GS B, GS b, GS (N**
	Etc.	**ESC SP, ESC 2, ESC 3**
Bar codes		**GS H, GS f, GS h, GS w**
2-dimensional codes		Function 065 through Function 070 of **GS (k**
Print position		**ESC D, ESC T, ESC a, GS L, GS W**
Etc.		**ESC c 4, ESC c 5, GS (D , GS P**

GS (M *pL pH fn m* (*fn* = 1,49) **Function 1**

[Format]	ASCII	GS	(	M	*pL*	*pH*	*fn*	*m*
	Hex	1D	28	4D	*pL*	*pH*	*fn*	*m*
	Decimal	29	40	77	*pL*	*pH*	*fn*	*m*

[Range] (*pL* + *pH* × 256) = 2 (*pL* = 2, *pH* = 0)

m = 1, 49

[Description] Copies the setting stored in the active area to the *m* th storage area.

3.2.4 Control Command - continue

GS (M *pL pH fn m* (*fn* = 2,50) **Function 2**

[Format]

ASCII	GS	(	M	*pL*	*pH*	*fn*	*m*
Hex	1D	28	4D	*pL*	*pH*	*fn*	*m*
Decimal	29	40	77	*pL*	*pH*	*fn*	*m*

[Range] (*pL* + *pH* × 256) = 2 (*pL* = 2, *pH* = 0)

m = 0, 1, 48, 49

[Description] • When (*m* = 0, 48), initializes all settings in the active area, as described in these specifications.

• When (*m* = 1, 49), copies the setting stored in the *m* th storage area to the active area.

If no data in the storage area is protected, all settings in the active area are initialized, as described in these specifications.

GS (M *pL pH fn m* (*fn* = 3,51) **Function 3**

[Format]

ASCII	GS	(	M	*pL*	*pH*	*fn*	*m*
Hex	1D	28	4D	*pL*	*pH*	*fn*	*m*
Decimal	29	40	77	*pL*	*pH*	*fn*	*m*

[Range] (*pL* + *pH* × 256) = 2 (*pL* = 2, *pH* = 0)

m = 0, 1, 48, 49

[Description] • When (*m* = 0, 48), does not load data in the storage area to the active area upon initialization.

• When (*m* = 1, 49), loads data in the storage area to the active area upon initialization.

GS (N *pL pH fn [parameters]*

[Name] Select character style

[Description] Execute commands for the character style as specified by the function code *fn*.

fn	Format	No.	Description
48	**GS (N *pL pH fn m***	48	Selects character color.

GS (N *pL pH fn m* (*fn* = 48) **Function 48**

[Format]

ASCII	GS	(	N	*pL*	*pH*	*fn*	*m*
Hex	1D	28	4E	*pL*	*pH*	*fn*	*m*
Decimal	29	40	78	*pL*	*pH*	*fn*	*m*

[Range] (*pL* + *pH* × 256) = 2 (*pL* = 2, *pH* = 0)

fn = 48

m = 49 (when the single-color paper is selected)

m = 49, 50 (when two-color paper is selected)

[Default] *m* = 49

3.2.4 Control Command - continue

GS (N *pL pH fn m* (*fn* = 48) **Function 48** - continue

[Description] Print characters in the color specified by *m*.

m	Color
49	Color 1 (black (a high level of energy) on the specified two-color thermal paper)
50	Color 2 (red (a low level of energy) on the specified two-color thermal paper)

GS (k *pL pH cn fn [parameters]*

[Name] Setup and print symbol

[Description] Various processes are performed to the symbol specified with *cn* based on the function code (*fn*) setting.

cn	Type of Symbol
48	PDF417 (2-dimensional code)

cn	*fn*	Code	No.	Description
48	65	**GS (k *pL pH cn fn n***	065	Sets the number of columns for PDF417.
	66	**GS (k *pL pH cn fn n***	066	Sets the number of rows for PDF417.
	67	**GS (k *pL pH cn fn n***	067	Sets the module width of PDF417.
	68	**GS (k *pL pH cn fn n***	068	Sets the module height of PDF417.
	69	**GS (k *pL pH cn fn m n***	069	Sets the error correction level of PDF417 .
	80	**GS (k *pL pH cn fn m d1...dk***	080	Stores received data in the symbol storage area for PDF417.
	81	**GS (k *pL pH cn fn m***	081	Prints symbol data in the symbol storage area for PDF417.

- "Symbol data" refers to the data *(d1…dk)* received with Function 080.
- "Symbol storage area" refers to the range for storing data received with Function 080 before encoding.

3.2.4 Control Command - continue

GS (*k pL pH cn fn n* (*fn* = 65) Function 65

[Format]	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*n*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*n*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*n*

[Range] (*pL* + *pH* × 256) = 3 (*pL* = 3, *pH* = 0)

cn = 48 0 ≤ *n* ≤ 30

[Default] *n* = 0

[Description] Set the number of columns of the data area for PDF417.

- *n* = 0 specifies automatic processing. When automatic processing (*n* = 0) is specified, the number of columns is calculated with the number of code words based on the range of the printable area.
- *n* ≠ 0 sets the number of columns of the data area to n code words.

[Notes] The following data is not included in the number of columns.

- Start and stop patterns
- Left and right indicator code words

GS (*k pL pH cn fn n* (*fn* = 66) Function 66

[Format]	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*n*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*n*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*n*

[Range] (*pL* + *pH* × 256) = 3 (*pL* = 3, *pH* = 0)

cn = 48 3 ≤ *n* ≤ 90

n = 0

[Default] *n* = 0

[Description] Set the number of rows of data area for PDF417.

- *n* = 0 specifies automatic processing. When automatic processing (*n* = 0) is specified, the number of rows is calculated with the number of code words or the range of the printable area.
- *n* ≠ 0 sets the number of rows to *n*.

GS (*k pL pH cn fn n* (*fn* = 67) Function 67

[Format]	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*n*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*n*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*n*

[Range] (*pL* + *pH* × 256) = 3 (*pL* = 3, *pH* = 0)

cn = 48 2 ≤ *n* ≤ 8

[Default] *n* = 3

[Description] Set the module width of one PDF417 symbol to *n* dots.

3.2.4 Control Command - continue

GS (*k pL pH cn fn n* (fn = 68) Function 68

[Format]	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*n*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*n*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*n*

[Range] (*pL* + *pH* × 256) = 3 (*pL* = 3, *pH* = 0)

cn = 48

2 ≤ *n* ≤ 8

[Default] *n* = 3

[Description] Set the module height to [(module width) × *n*].

The module width is set with Function 067 of this command.

GS (*k pL pH cn fn m n* (*fn* = 69) Function 69

[Format]	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*m*	*n*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*m*	*n*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*m*	*n*

[Range] (*pL* + *pH* × 256) = 4 (*pL* = 4, *pH* = 0)

cn = 48

m = 48, 49

48 ≤ *n* ≤ 56 (when *m* = 48 is specified)

1 ≤ *n* ≤ 40 (when *m* = 49 is specified)

[Default] *m* = 49

n = 1

[Description] Set the error correction level for PDF417 symbols.

When *m* = 48, the error correction level is set by the “Level Setting” error correction code word.

n	Function	Error Correction Code Word
48	Select error correction level 0	2
49	Select error correction level 1	4
50	Select error correction level 2	8
51	Select error correction level 3	16
52	Select error correction level 4	32
53	Select error correction level 5	64
54	Select error correction level 6	128
55	Select error correction level 7	256
56	Select error correction level 8	512

3.2.4 Control Command - continue

GS (*k pL pH cn fn m n* (*fn* = 69) **Function 69** - continue

When *m* = 49, the error correction level is set to the level indicated by the data code word value. The rate is set to [*n* × 10%].

The error correction levels in the following table are determined by the calculation [Data code word × *n* × 0.1 = (A)]

(Round up fractions of 0.5 and over and truncate others).

Result (A)	Error Correction Level	Error Correction Code Word
0 - 3	Error correction level 1	4
4 - 10	Error correction level 2	8
11 - 20	Error correction level 3	16
21 - 45	Error correction level 4	32
46 - 100	Error correction level 5	64
101 - 200	Error correction level 6	128
201 - 400	Error correction level 7	256
401 or more	Error correction level 8	512

GS (*k pL pH cn fn m d1 …dk* (*fn* = 80) **Function 80**

[Format]	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*m*	*d1…dk*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*m*	*d1…dk*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*m*	*d1…dk*

[Range] 4 ≤ (*pL* + *pH* × 256) ≤ 65535 (0 ≤ *pL* ≤ 255, 0 ≤ *pH* ≤ 255)

cn = 48 0 ≤ *d* ≤ 255

m = 48 *k* = (*pL* + *pH* × 256) - 3

[Description] Stores symbol data (*d1...dk*) in the PDF417 symbol storage area.

Bytes of ((*pL* + *pH* × 256) - 3) after *m (d1…dk)* are processed as symbol data.

GS (*k pL pH cn fn m* (*fn* = 81) **Function 81**

[Format]	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*m*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*30*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*48*

[Range] (*pL* + *pH* × 256) = 3 (*pL* = 3, *pH* = 0)

cn = 48

m = 48

[Description] Print the PDF417 symbol data in the symbol storage area.

[Note] Users must consider the quiet zone for the PDF417 symbols (Upward and downward spaces and left and right spaces for the PDF417 symbols specified in the specifications for the PDF417 symbols.)

3.2.4 Control Command - continue

GS * *x y d1…d(x × y × 8)*

[Name] Define downloaded bit image.

[Format]

ASCII	GS	*	*x*	*y*	*d1…d(x × y × 8)*
Hex	1D	2A	*x*	*y*	*d1…d(x × y × 8)*
Decimal	29	42	*x*	*y*	*d1…d(x × y × 8)*

[Range] $1 \le x \le 255$

$1 \le y \le 48$

$x \times y \le 1536$

$0 \le d \le 255$

[Description] Define a downloaded bit image using the dots specified by *x* and *y*.

- *x* indicate the number of bytes in the horizontal direction.
- *y* indicate the number of bytes in the vertical direction.

GS / *m*

[Name] Print downloaded bit image.

[Format]

ASCII	GS	/	*m*
Hex	1D	2F	*m*
Decimal	29	47	*m*

[Range] $0 \le m \le 3$

$48 \le m \le 51$

[Description] Print a downloaded bit image using the mode specified by *m*. *m* selects a mode from the table below:

m	Mode	Vertical Dot Density (DPI)	Horizontal Dot Density (DPI)
0, 48	Normal	180 DPI	180 DPI
1, 49	Double-width	180 DPI	90 DPI
2, 50	Double-height	90 DPI	180 DPI
3, 51	Quadruple	90 DPI	90 DPI

GS :

[Name] Start/End macro definition.

[Format]

ASCII	GS	:
Hex	1D	3A
Decimal	29	58

[Description] Start or end macro definition.

3.2.4 Control Command - continue

GS B *n*

[Name] Turn white/black reverse printing mode on/off.

[Format]

ASCII	GS	B	*n*
Hex	1D	42	*n*
Decimal	29	66	*n*

[Range] $0 \le n \le 255$

[Default] $n = 0$

[Description] Turn on or off white/black reverse printing mode.

- When the LSB is 0, white/black reverse printing mode is turned off.
- When the LSB is 1, white/black reverse printing mode is turned on.

GS H *n*

[Name] Select printing position of HRI characters.

[Format]

ASCII	GS	H	*n*
Hex	1D	48	*n*
Decimal	29	72	*n*

[Default] $n = 0$

[Description] Select the printing position of HRI characters when printing a bar code. *n* selects the printing position as follows:

n	Printing Position
0, 48	Not printed.
1, 49	Above bar code.
2, 50	Below bar code.
3, 51	Both above and below the bar code.

- HRI indicate Human Readable Interpretation.

GS I *n*

[Name] Transmit printer ID.

[Format]

ASCII	GS	I	*n*
Hex	1D	49	*n*
Decimal	29	73	*n*

[Range] $n = 112$

$1 \le n \le 3$

$49 \le n \le 51$

$65 \le n \le 69$

3.2.4 Control Command - continue

GS I *n* - continue

[Description] Transmit the printer ID specified by *n* as follows:

n	Printer ID	Specification	ID (hexadecimal)
1, 49	Printer model ID	ELLIX 20 series	20
2, 50	Type ID	-	02
3, 51	ROM version ID	Depends on ROM version	01

n specify the printer information.

n	Printer ID Type	ID
65	Firmware version	Depends on firmware version
66	Manufacturer	Sam4s
67	Printer name	ELLIX20
68	Product ID	-
69	Type of model	STD ENGLISH
112	Status of DIP switches	See 'DIP switch status information' on the next sheet

Type ID

Bit	ON/OFF	Hex	Decimal	Function
0	Off	00	0	Two-byte code characters not supported.
	On	01	1	Two-byte code characters supported.
1	Off	00	0	Auto cutter not installed.
	On	02	2	Auto cutter installed.
2	Off	00	0	Reserved.
3	Off	00	0	Reserved.
4	Off	00	0	Fixed.
5	Off	00	0	Reserved.
6	Off	00	0	Reserved.
7	Off	00	0	Fixed.

3.2.4 Control Command - continue

GS I *n* - continue

1st byte of DIP switch status information

Bit	ON/OFF	Hex	Decimal	Function
0	Off	00	0	DIP SW 1: Off
	On	01	1	DIP SW 1: On
1	Off	00	0	DIP SW 2: Off
	On	02	2	DIP SW 2: On
2	Off	00	0	DIP SW 3: Off
	On	04	4	DIP SW 3: On
3	Off	00	0	DIP SW 4: Off
	On	08	8	DIP SW 4: On
4	Off	00	0	Reserved.
5	Off	00	0	Reserved.
6	On	40	64	Fixed.
7	Off	00	0	Fixed.

2nd byte of DIP switch status information

Bit	ON/OFF	Hex	Decimal	Function
0	Off	00	0	DIP SW 5: Off
	On	01	1	DIP SW 5: On
1	Off	00	0	DIP SW 6: Off
	On	02	2	DIP SW 6: On
2	Off	00	0	DIP SW 7: Off
	On	04	4	DIP SW 7: On
3	Off	00	0	DIP SW 8: Off
	On	08	8	DIP SW 8: On
4	Off	00	0	Reserved.
5	Off	00	0	Reserved.
6	On	40	64	Fixed.
7	Off	00	0	Fixed.

3.2.4 Control Command - continue

GS L *nL nH*

[Name] Set left margin.

[Format]

ASCII	GS	L	*nL*	*nH*
Hex	1D	4C	*nL*	*nH*
Decimal	29	76	*nL*	*nH*

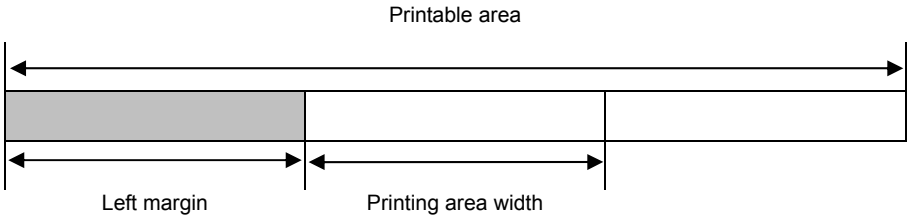
[Range] $0 \le nL \le 255$

$0 \le nH \le 255$

[Default] $nL = nH = 0$

[Description] Set the left margin using *nL* and *nH*.

The left margin is set to [(*nL* + *nH* × 256) × horizontal motion unit)] inches.



GS P *x y*

[Name] Set horizontal and vertical motion units.

[Format]

ASCII	GS	P	*x*	*y*
Hex	1D	50	*x*	*y*
Decimal	29	80	*x*	*y*

[Range] $0 \le nL \le 255$

$0 \le nH \le 255$

[Default] $x = 180$

$y = 360$

[Description] Set the horizontal and vertical motion unit to approximately 25.4/*x* mm { 1/*x* inch } and approximately 25.4/*y* mm { 1/*y* inches } respectively.

When *x* and *y* are set to 0, the default setting of each value is used.

3.2.4 Control Command - continue

① GS V *m* ② GS V *m n*

[Name] Select cut mode and cut paper.

[Format]

① ASCII	GS	V	*m*		② ASCII	GS	V	*m*	*n*
Hex	1D	56	*m*		Hex	1D	56	*m*	*n*
Decimal	29	86	*m*		Decimal	29	86	*m*	*n*

[Range] ① $m = 1, 49$ ② $m = 66, 0 \le n \le 255$

[Description] Select a mode for cutting paper and executes paper cutting. The value of *m* selects the mode as follows:

m	Print Mode
0, 1, 49	Partial cut (one point left uncut)
66	Feeds paper (cutting position + [*n* × (vertical motion unit)]), and cuts the paper partially (one point left uncut)

GS W *nL nH*

[Name] Set printing area width.

[Format]

ASCII	GS	W	*nL*	*nH*
Hex	1D	57	*nL*	*nH*
Decimal	29	87	*nL*	*nH*

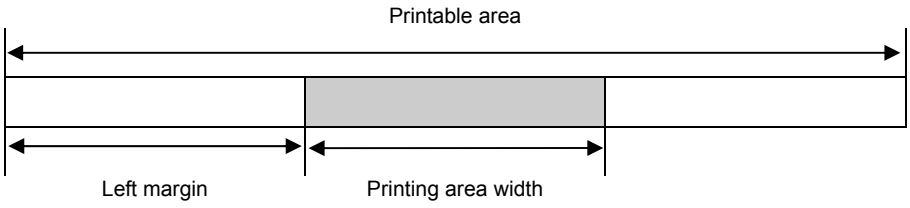
[Range] $0 \le nL \le 255$ $0 \le nH \le 255$

[Default] (*nL* + *nH* × 256) = 512 (*nL* = 0, *nH* = 2) (for 80 mm of the paper width)

(*nL* + *nH* × 256) = 360 (*nL* = 104, *nH* = 1) (for 58 mm of the paper width)

[Description] Set the printing area width to the area specified by *nL* and *nH*.

The printing area width is set to [(*nL* + *nH* × 256) × horizontal motion unit)] inches.



3.2.4 Control Command - continue

GS \ *nL nH*

[Name] Set relative vertical print position in page mode

[Format]

ASCII	GS	\	*nL*	*nH*
Hex	1D	5C	*nL*	*nH*
Decimal	29	92	*nL*	*nH*

[Range] $0 \le nL \le 255$

$0 \le nH \le 255$

[Description] Set the relative vertical print starting position from the current position in page mode.

This command sets the distance from the current position to [(*nL* + *nH* × 256) × vertical or horizontal motion unit] inches.

GS ^ *r t m*

[Name] Execute macro.

[Format]

ASCII	GS	^	*r*	*t*	*m*
Hex	1D	5E	*r*	*t*	*m*
Decimal	29	94	*r*	*t*	*m*

[Range] *m* = 0, 1 $0 \le r \le 255$

$0 \le t \le 255$

[Description]

- *r* specify the number of times to execute the macro.
- *t* specify the waiting time for executing the macro.
- *m* specify macro executing mode.
- When the LSB of *m* = 0, the macro executes *r* times continuously at the interval specified by *t*.
- When the LSB of *m* = 1, after waiting for the period specified by *t*, the PAPER OUT LED indicator blink and the printer wait for the FEED button to be pressed. After the button is pressed, the printer executes the macro once. The printer repeats the operation *r* times.

3.2.4 Control Command - continue

GS a *n*

[Name] Enable/Disable Automatic Status Back.

[Format]

ASCII	GS	a	*n*
Hex	1D	61	*n*
Decimal	29	97	*n*

[Range] $0 \le n \le 255$

[Default] $n = 0$

[Description] Enable or disable ASB and specifies the status items to include, using *n* as follows:

Bit	ON/OFF	Hex	Decimal	Status for ASB
0	Off	00	0	Drawer kick-out connector pin 3 status disabled.
	On	01	1	Drawer kick-out connector pin 3 statuses enabled.
1	Off	00	0	On-line/off-line disabled.
	On	02	2	On-line/off-line enabled.
2	Off	00	0	Error status disabled.
	On	04	4	Error status enabled.
3	Off	00	0	Paper roll sensor status disabled.
	On	08	8	Paper roll sensor status enabled.
4-7	-	-	-	Undefined.

The status to be transmitted is the four bytes that follow: First byte (printer information)

Bit	ON/OFF	Hex	Decimal	Function
0	Off	00	0	Fixed.
1	Off	00	0	Fixed.
2	Off	00	0	Drawer kick-out connector pin 3 is LOW.
	On	04	4	Drawer kick-out connector pin 3 is HIGH.
3	Off	00	0	On-line.
	On	08	8	Off-line.
4	On	10	16	Fixed.
5	Off	00	0	Cover is closed.
	On	20	32	Cover is open.
6	Off	00	0	Paper is not being fed by using the paper FEED button.
	On	40	64	Paper is being fed by using the paper FEED button.
7	Off	00	0	Fixed.

3.2.4 Control Command - continue

GS a *n* - continue

If the cover is open, the printer goes offline. Second byte (printer information)

Bit	ON/OFF	Hex	Decimal	Function
0	Off	00	0	Not in on-line waiting status.
	On	01	1	During on-line waiting status.
1	Off	00	0	Panel button OFF.
	On	02	2	Panel button ON.
2	Off	00	0	No mechanical error.
	On	04	4	Mechanical error has occurred.
3	Off	00	0	No auto cutter error.
	On	08	8	Auto cutter error occurred.
4	Off	00	0	Fixed.
5	Off	00	0	No unrecoverable error.
	On	20	32	Unrecoverable error has occurred.
6	Off	00	0	No automatically recoverable error.
	On	40	64	Automatically recoverable error has occurred.
7	Off	00	0	Fixed.

Third byte (paper sensor information)

Bit	ON/OFF	Hex	Decimal	Function
0	Off	00	0	Roll paper near-end sensor: Paper adequate.
	On	01	1	Roll paper near-end sensor: Paper near end.
1	Off	00	0	Roll paper near-end sensor: Paper present.
	On	02	2	Roll paper near-end sensor: Paper not present.
2	Off	00	0	Roll paper end sensor: Paper present.
	On	04	4	Roll paper end sensor: Paper not present.
3	Off	00	0	Roll paper end sensor: Paper present.
	On	08	8	Roll paper end sensor: Paper not present.
4	Off	00	0	Fixed.
5	Off	00	0	Reserved.
6	Off	00	0	Reserved.
7	Off	00	0	Fixed.

3.2.4 Control Command - continue

GS a *n* - continue

The paper roll end sensor is unstable when the cover is open. Fourth byte (paper sensor information)

Bit	ON/OFF	Hex	Decimal	Function
0	On	01	1	Reserved.
1	On	02	2	Reserved.
2	On	04	4	Reserved.
3	On	08	8	Reserved.
4	Off	00	0	Fixed.
5	Off	00	0	Reserved.
6	Off	00	0	Reserved.
7	Off	00	0	Fixed.

[Note] Any accumulated ASB status signals left for transmission from the last to the newest ASB status transmission shall be transmitted together at one time as one ASB status, showing the presence of change, followed by the latest ASB status

Example : In the normal (wait) state, the ASB status is configured as follows.

First Status	Second Status	Third Status	Fourth Status
0001 0000	0000 0000	0000 0000	0000 1111

. When a sequence of operations Is performed, the near end is detected, the printer cover is opened, and then the printer cover is closed, the following pieces of data are accumulated.

	First Status	Second Status	Third Status	Fourth Status	
①	0001 0000	0000 0000	0000 0011	0000 1111	Near end diction
②	0011 1000	0000 0000	0000 0011	0000 1111	The printer cover is opened
③	0001 0000	0000 0000	0000 0011	0000 1111	The printer cover is closed

When the ASB status is received following this, a total of eight (8) bytes of ASB will be transmitted as follows.

Accumulated ASB (①+②+③)

	First Status	Second Status	Third Status	Fourth Status
Accumulated ASB (①+②+③)	0011 1000	0000 0000	0000 0011	0000 1111
+				
	First Status	Second Status	Third Status	Fourth Status
The latest ASB (③)	0001 0000	0000 0000	0000 0011	0000 1111
Fourth Status				

3.2.4 Control Command - continue

GS f *n*

[Name] Select font for Human Readable Interpretation (HRI) characters.

[Format]

ASCII	GS	f	*n*
Hex	1D	66	*n*
Decimal	29	102	*n*

[Range] *n* = 0, 1, 48, 49

[Default] *n* = 0

[Description] Select a font for the HRI characters used when printing a bar code. *n* selects a font from the following table:

n	Font
0, 48	Font A (12 × 24)
1, 49	Font B (9 × 17)

GS h *n*

[Name] Set bar code height.

[Format]

ASCII	GS	h	*n*
Hex	1D	68	*n*
Decimal	29	104	*n*

[Range] $1 \le n \le 255$

[Default] *n* = 162

[Description] Set the height of the bar code.

n specify the number of dots in the vertical direction.

① GS k *m d1... dk NUL*, ② GS k *m n d1... dn*

[Name] Print bar code.

[Format]

① ASCII	GS	k	*m*	*d1...dk*	*NUL*
Hex	1D	6B	*m*	*d1...dk*	*00*
Decimal	29	107	*m*	*d1...dk*	*0*
② ASCII	GS	k	*m*	*n*	*d1... dn*
Hex	1D	6B	*m*	*n*	*d1... dn*
Decimal	29	107	*m*	*n*	*d1... dn*

[Range] ① $0 \le m \le 6$ (*k* and d depends on the bar code system used.)

② $65 \le m \le 73$ (*n* and d depends on the bar code system used)

3.2.4 Control Command - continue

① GS k *m d1... dk NUL*, ② GS k *m n d1... dn* - continue

[Description] Select a bar code system and prints the bar-code. *m* select a bar code system as follows:

m		Bar Code System	Number of Characters	Remarks
①	0	UPC-A	$11 \le k \le 12$	$48 \le d \le 57$
	1	UPC-E	$11 \le k \le 12$	$48 \le d \le 57$
	2	EAN13	$12 \le k \le 13$	$48 \le d \le 57$
	3	EAN8	$7 \le k \le 8$	$48 \le d \le 57$
	4	CODE 39	$1 \le k$	$48 \le d \le 57$, $65 \le d \le 90$,32, 36,37,43,45, 46,47
	5	ITF	$1 \le k$ (even number)	$48 \le d \le 57$
	6	CODABAR	$1 \le k$	$48 \le d \le 57$, $65 \le d \le 68$, 36,43,45,46,47, 58
②	65	UPC-A	$11 \le n \le 12$	$48 \le d \le 57$
	66	UPC-E	$11 \le n \le 12$	$48 \le d \le 57$
	67	EAN13	$12 \le n \le 13$	$48 \le d \le 57$
	68	EAN8	$7 \le n \le 8$	$48 \le d \le 57$
	69	CODE 39	$1 \le n \le 255$	$48 \le d \le 57$, $65 \le d \le 90$,32, 36,37,43,45, 46,47
	70	ITF	$1 \le n \le 255$ (even number)	$48 \le d \le 57$
	71	CODABAR	$1 \le n \le 255$	$48 \le d \le 57$, $65 \le d \le 68$, 36, 43,45,46,47, 58
	72	CODE93	$1 \le n \le 255$	$0 \le d \le 127$
	73	CODE128	$2 \le n \le 255$	$0 \le d \le 127$

[Note] **Description of the CODE128 Bar Code**

- In CODE128 bar code system, it is possible to represent 128 ASCII characters and 2-digit numerals using one bar code character that is defined by combining one of the 103 bar code characters and 3 code sets. Each code set is used for representing the following characters

  Code set A: ASCII characters 00H to 5FH

  Code set B: ASCII characters 20H to 7FH

  Code set C: 2-digits numeral characters using one character (100 numerals from 00 to 99)

- The following special characters are also available in CODE128:

  SHIFT character In code set A, the character just after SHIFT is processed as a character for code set B.

  In code set B, the character just after SHIFT is processed as the character for code set A.

  SHIFT characters cannot be used in code set C.

  Code set selection character (CODEA, CODEB, CODEC)

  This character switches the following code set to code set A, B, or C.

  Function character (FNC1, FNC2, FNC3, FNC4)

  The usage of function characters depends on the application software.

  In code set C, only FNC1 is available.

3.2.4 Control Command - continue

① GS k *m d1... dk NUL*, ② GS k *m n d1... dn* - continue

[Code Table] Printable characters in code set A

Character	Transmit Data		Character	Transmit Data		Character	Transmit Data	
	Hex	Decimal		Hex	Decimal		Hex	Decimal
NUL	00	0	#	23	35	F	46	70
SOH	01	1	$	24	36	G	47	71
STX	02	2	%	25	37	H	48	72
ETX	03	3	&	26	38	I	49	73
EOT	04	4	'	27	39	J	4A	74
ENQ	05	5	(	28	40	K	4B	75
ACK	06	6	)	29	41	L	4C	76
BEL	07	7	*	2A	42	M	4D	77
BS	08	8	+	2B	43	N	4E	78
HT	09	9	,	2C	44	O	4F	79
LF	0A	10	-	2D	45	P	50	80
VT	0B	11	.	2E	46	Q	51	81
FF	0C	12	/	2F	47	R	52	82
CR	0D	13	0	30	48	S	53	83
SO	0E	14	1	31	49	T	54	84
SI	0F	15	2	32	50	U	55	85
DLE	10	16	3	33	51	V	56	86
DC1	11	17	4	34	52	W	57	87
DC2	12	18	5	35	53	X	58	88
DC3	13	19	6	36	54	Y	59	89
DC4	14	20	7	37	55	Z	5A	90
NAK	15	21	8	38	56	[	5B	91
SYN	16	22	9	39	57	\	5C	92
ETB	17	23	:	3A	58	]	5D	93
CAN	18	24	;	3B	59	^	5E	94
EM	19	25	<	3C	60	_	5F	95
SUB	1A	26	=	3D	61	FNC1	7B,31	123,49
ESC	1B	27	>	3E	62	FNC2	7B,32	123,50
FS	1C	28	?	3F	63	FNC3	7B,33	123,51
GS	1D	29	@	40	64	FNC4	7B,34	123,52
RS	1E	30	A	41	65	SHIFT	7B,53	123,83
US	1F	31	B	42	66	CODEB	7B,42	123,66
SP	20	32	C	43	67	CODEC	7B,43	123,67
!	21	33	D	44	68	-	-	-
"	22	34	E	45	69	-	-	-

3.2.4 Control Command - continue

① GS k *m d1... dk NUL*, ② GS k *m n d1... dn* - continue

[Code Table] Printable characters in code set B

Character	Transmit Data		Character	Transmit Data		Character	Transmit Data	
	Hex	Decimal		Hex	Decimal		Hex	Decimal
SP	20	32	B	42	66	e	65	101
!	21	33	C	43	67	f	66	102
"	22	34	D	44	68	g	67	103
#	23	35	E	45	69	h	68	104
$	24	36	F	46	70	i	69	105
%	25	37	G	47	71	j	6A	106
&	26	38	H	48	72	k	6B	107
'	27	39	I	49	73	l	6C	108
(	28	40	J	4A	74	m	6D	109
)	29	41	K	4B	75	n	6E	110
*	2A	42	L	4C	76	o	6F	111
+	2B	43	M	4D	77	p	70	112
,	2C	44	N	4E	78	q	71	113
_	2D	45	O	4F	79	r	72	114
.	2E	46	P	50	80	s	73	115
/	2F	47	Q	51	81	t	74	116
0	30	48	R	52	82	u	75	117
1	31	49	S	53	83	v	76	118
2	32	50	T	54	84	w	77	119
3	33	51	U	55	85	x	78	120
4	34	52	V	56	86	y	79	121
5	35	53	W	57	87	z	7A	122
6	36	54	X	58	88	{	7B,7B	123,123
7	37	55	Y	59	89	|	7C	124
8	38	56	Z	5A	90	}	7D	125
9	39	57	[	5B	91	—	7E	126
:	3A	58	\	5C	92	DEL	7F	127
;	3B	59	]	5D	93	FNC1	7B,31	123,49
<	3C	60	^	5E	94	FNC2	7B,32	123,50
=	3D	61	_	5F	95	FNC3	7B,33	123,51
>	3E	62	`	60	96	FNC4	7B,34	123,52
?	3F	63	a	61	97	SHIFT	7B,53	123,83
@	40	64	b	62	98	CODEA	7B,41	123,66
A	41	65	c	63	99	CODEC	7B,43	123,67
-	-	-	d	64	100	-	-	-

3.2.4 Control Command - continue

① GS k *m d1... dk NUL*, ② GS k *m n d1... dn* - continue

[Code Table] Printable characters in code set C

Character	Transmit Data		Character	Transmit Data		Character	Transmit Data	
	Hex	Decimal		Hex	Decimal		Hex	Decimal
00	00	0	35	23	35	70	46	70
01	01	1	36	24	36	71	47	71
02	02	2	37	25	37	72	48	72
03	03	3	38	26	38	73	49	73
04	04	4	39	27	39	74	4A	74
05	05	5	40	28	40	75	4B	75
06	06	6	41	29	41	76	4C	76
07	07	7	42	2A	42	77	4D	77
08	08	8	43	2B	43	78	4E	78
09	09	9	44	2C	44	79	4F	79
10	0A	10	45	2D	45	80	50	80
11	0B	11	46	2E	46	81	51	81
12	0C	12	47	2F	47	82	52	82
13	0D	13	48	30	48	83	53	83
14	0E	14	49	31	49	84	54	84
15	0F	15	50	32	50	85	55	85
16	10	16	51	33	51	86	56	86
17	11	17	52	34	52	87	57	87
18	12	18	53	35	53	88	58	88
19	13	19	54	36	54	89	59	89
20	14	20	55	37	55	90	5A	90
21	15	21	56	38	56	91	5B	91
22	16	22	57	39	57	92	5C	92
23	17	23	58	3A	58	93	5D	93
24	18	24	59	3B	59	94	5E	94
25	19	25	60	3C	60	95	5F	95
26	1A	26	61	3D	61	96	60	96
27	1B	27	62	3E	62	97	61	97
28	1C	28	63	3F	63	98	62	98
29	1D	29	64	40	64	99	63	99
30	1E	30	65	41	65	FNC1	7B,31	123,49
31	1F	31	66	42	66	CODEA	7B,41	123,65
32	20	32	67	43	67	CODEB	7B,42	123,66
33	21	33	68	44	68	-	-	-
34	22	34	69	45	69	-	-	-

3.2.4 Control Command - continue

GS r *n*

[Name] Transmit status.

[Format]

ASCII	GS	r	*n*
Hex	1D	72	*n*
Decimal	29	114	*n*

[Range] *n* = 1, 2, 49, 50

[Description] Transmit the status specified by *n* as follows.

n	Function
1,49	Transmits paper sensor status.
2,50	Transmits drawer kick-out connector status.

Paper sensor status (*n* = 1, 49):

Bit	ON/OFF	Hex	Decimal	Function
0, 1	Off	00	0	Roll paper near-end sensor: paper adequate.
	On	03	3	Roll paper near-end sensor: paper near end.
2, 3	Off	00	0	Roll paper end sensor: paper present.
	On	0C	12	Roll paper end sensor: paper not present.
4	Off	00	0	Fixed.
5	Off	00	0	Reserved.
6	Off	00	0	Reserved.
7	Off	00	0	Fixed.

• **Bits 2 and 3**: This command cannot be executed, since the printer goes offline when the roll paper end sensor detects that the paper is not present. Therefore, the status of bit 2 (1) and bit 3 (1) is not transmitted.

Drawer kick-out connector status (*n* = 2, 50):

Bit	ON/OFF	Hex	Decimal	Function
0	Off	00	0	Drawer kick-out connector pin 3 is LOW.
	On	01	1	Drawer kick-out connector pin 3 is HIGH.
1	Off	00	0	Reserved.
2	Off	00	0	Reserved.
3	Off	00	0	Reserved.
4	Off	00	0	Fixed.
5	Off	00	0	Reserved.
5	Off	00	0	Reserved.
7	Off	00	0	Fixed.

3.2.4 Control Command - continue

GS v *0 m xL xH yL yH d1….dk*

[Name] Print raster bit image

[Format]

ASCII	GS	v	0	*m*	*xL*	*xH*	*yL*	*yH*	*d1….dk*
Hex	1D	76	30	*m*	*xL*	*xH*	*yL*	*yH*	*d1….dk*
Decimal	29	118	48	*m*	*xL*	*xH*	*yL*	*yH*	*d1….dk*

[Range] $0 \le m \le 3$ $48 \le m \le 51$

$0 \le (xL + xH \times 256) \le 128$ $(0 \le xL \le 128, xH = 0)$

$0 \le (yL + yH \times 256) \le 4095$ $(0 \le yL \le 255, 0 \le yH \le 15)$

$0 \le d \le 255$ $k = (xL + xH \times 256) \times (yL + yH \times 256)$

[Description] Select Raster bit-image mode. The value of *m* selects the mode, as follows:

M	Mode	Vertical Dot Density (DPI)	Horizontal Dot Density (DPI)
0, 48	Normal	180 DPI	180 DPI
1, 49	Double-width	180 DPI	90 DPI
2, 50	Double-height	90 DPI	180 DPI
3, 51	Quadruple	90 DPI	90 DPI

- *xL, xH*, select the number of data bits (*xL*+*xH*x256) in the horizontal direction for the bit image.
- *yL, yH*, select the number of data bits (*yL*+*yH*x256) in the vertical direction for the bit image.

GS w *n*

[Name] Set bar code width.

[Format]

ASCII	GS	w	*n*
Hex	1D	77	*n*
Decimal	29	119	*n*

[Range] $2 \le n \le 6$

[Default] $n = 3$

[Description] Set the horizontal size of the bar code. *n* specifies the bar code width as follows.

n	Module Width for Multi-Level Bar Code	Binary-Level Bar Code	
		Thin Element Width (mm)	Thick Element Width (mm)
2	0.282	0.282	0.706
3	0.423	0.423	1.129
4	0.564	0.564	1.411
5	0.706	0.706	1.834
6	0.847	0.847	2.258

- Multi-level bar codes are as follows: UPC-A, UPC-E, EAN13, EAN8, CODE93, and CODE128.
- Binary-level bar codes are as follows: CODE39, ITF, and CODABAR

3.2.4 Control Command - continue

[STAR Emulation Mode] Command Summary

Control	Hexadecimal codes	Function
<ESC> “R” n	1B 52 n	Select International character set
<ESC> <GS> t n	1B 1D 74 n	Select character table
<ESC> “/” “1” <ESC> “/” <1>	1B 2F 31 1B 2F 01	Select slash zero
<ESC> “/” “0” <ESC> “/” <0>	1B 2F 30 1B 2F 00	Select normal zero
<ESC> “b” n1 n2 n3 n4 d1…dk <RS>	1B 62 n1 n2 n3 n4 d1…dk 1E	Select bar code printing
<ESC> “M”	1B 4D	Select 12-dot pitch printing
<ESC> “p”	1B 70	Select 14-dot pitch Printing
<ESC> “P”	1B 50	Select 15-dot pitch Printing
<ESC> “:”	1B 3A	Select 16-dot pitch Printing
<ESC> <SP> n	1B 20 n	Set character spacing
<SO>	0E	Sets the printing magnified double in character width.
<DC4>	14	Resets the printing magnified in character width.
<ESC> “W” n	1B 57 n	Sets the magnification rate in character width.
<ESC> <SO>	1B 0E	Sets the printing magnified double in character height.
<ESC> <DC4>	1B 14	Resets the printing magnified in character height.
<ESC> “h” n	1B 68 n	Sets the magnification rate in character height.
<ESC> “-“ “1” <ESC> “-“ <1>	1B 2D 31 1B 2D 01	Select underlining
<ESC> “_“ “1” <ESC> “_“ <1>	1B 5F 31 1B 5F 01	Select overlining
<ESC> “4”	1B 34	Select White/Black reverse printing
<ESC> “5”	1B 35	Cancel White/Black reverse printing
<SI>	0F	Inverted printing

3.2.4 Control Command - continue

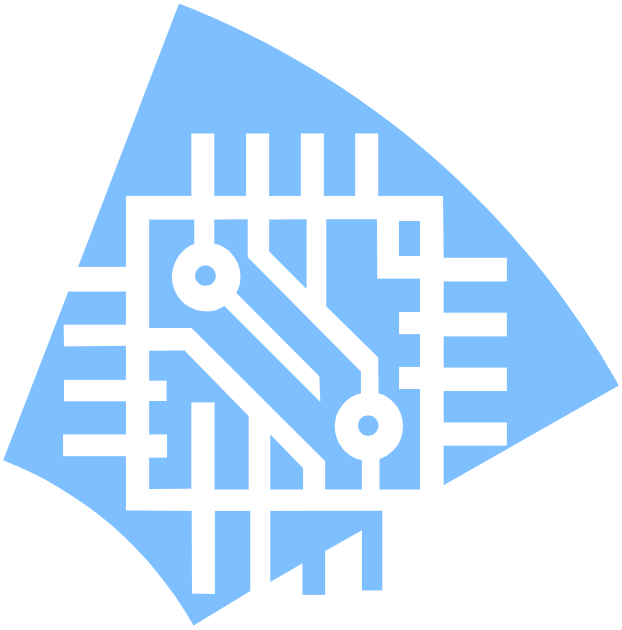
[STAR Emulation Mode] Command Summary - continue

Control	Hexadecimal codes	Function
<DC2>	12	Cancel inverted printing
<ESC> “E”	1B 45	Select emphasized printing
<ESC> “F”	1B 46	Cancel emphasized printing
<ESC> “C” n	1B 43 n	Set page length in lines
<ESC> “C” <0> n	1B 43 00 n	Set page length in inches
<ESC> “N” n	1B 4E n	Set bottom margin
<ESC> “O”	1B 4F	Cancel bottom margin
<ESC> “l” n	1B 6C n	Set left margin
<ESC> “Q” n	1B 51 n	Set right margin
<LF>	0A	Line Feed
<ESC> “a” n	1B 61 n	Feed paper n lines
<FF>	0C	Form Feed
<HT>	09	Horizontal tab
<VT>	0B	Vertical tab
<ESC> “z” “1”	1B 7A 31	Set line spacing to 4mm
<ESC> “0”	1B 30	Set line spacing to 3mm
<ESC> “J” n	1B 4A n	One time n/4 mm feed
<ESC> “I” n	1B 49 n	One time n/8 mm feed
<ESC> “B” n1 n2… <0>	1B 42 n1 n2 … 00	Set vertical tab stops
<ESC> “D” n1 n2…<0>	1B 43 n1 n2 … 00	Set horizontal tab stops
<ESC> <GS> “A” n1 n2	1B 1D 41 n1 n2	Absolute position setting
<ESC> <GS> “R” n1 n2	1B 1D 52 n1 n2	Relative position setting
<ESC> <GS> “a” n	1B 1D 61 n	Alignment
<ESC> “K” n1 n2 d1…dk	1B 4B n1 n2 d1…dk	Print normal density graphics
<ESC> “L” n1 n2 d1…dk	1B 4C n1 n2 d1…dk	Print high density graphics
<ESC> “k” n1 n2 d1…dk	1B 6B n1 n2 d1…dk	Print fine density graphics
<ESC> “X” n1 n2 d1…dk	1B 58 n1 n2 d1…dk	Print fine density graphics
<ESC> <FS> “p” n m	1B 1C 70 n m	Print NV bit image
<ESC> <FS> “q” n d1…	1B 1C 71 n d1…	Define NV bit image

3.2.4 Control Command - continue

[STAR Emulation Mode] Command Summary - continue

Control	Hexadecimal codes	Function
<ESC> “&” “1” “1 “ n m1 m2 … m48	1B 26 31 31 n m1 m2…m48	Define download character
<ESC> “&” <1> <1> n m1 m2…m48	1B 26 01 01 n m1 m2…m48	
<ESC> “&” “1” “0” n	1B 26 31 30 n	Delete a download character
<ESC> “&” <1> <0> n	1B 26 01 00 n	
<ESC> “%” “1”	1B 25 31	Enable download character set
<ESC> “%” <1>	1B 25 01	
<ESC> “%” “0”	1B 25 30	Disable download character set
<ESC> “%” <0>	1B 25 00	
<ESC> <GS> “*” x y d1…d(x×y×8)	1B 1D 2A x y d1…d(x×y×8)	Definition of download bit image
<ESC> <GS> “/” m	1B 1D 2F m	Printing of download nit image
<ESC> <BEL> n1 n2	1B 07 n1 n2	Define drive pulse width for peripheral device #1
<BEL>	07	Control peripheral device #1
<FS>	1C	Control peripheral device #1 immediately
<EM>	19	Control peripheral device #2 immediately
<SUB>	1A	Control peripheral device #2 immediately
<ESC> “d” n	1B 64 n	Partial-cut command to the auto cutter
<CAN>	18	Cancel last line & Initialize printer immediately
<DC3>	13	Deselect printer
<DC1>	11	Set select mode
<RS>	1E	Beep the buzzer
<ESC> “@”	1B 40	Initialize printer
<ENQ>	05	Inquiry(Status inquiry)
<EOT>	04	Near end status inquiry
<ESC> “?” <LF> <NUL>	1B 3F 0A 00	Reset printer hardware (Perform test print)
<ESC> “8” n1 n2 d1…	1B 38 n1 n2 d1…	Registers a logo pattern
<ESC> “9” n1 n2	1B 39 n1 n2	Prints a logo pattern



Chapter 4

Disassembly and Assembly

4.1 Case-Lower Block

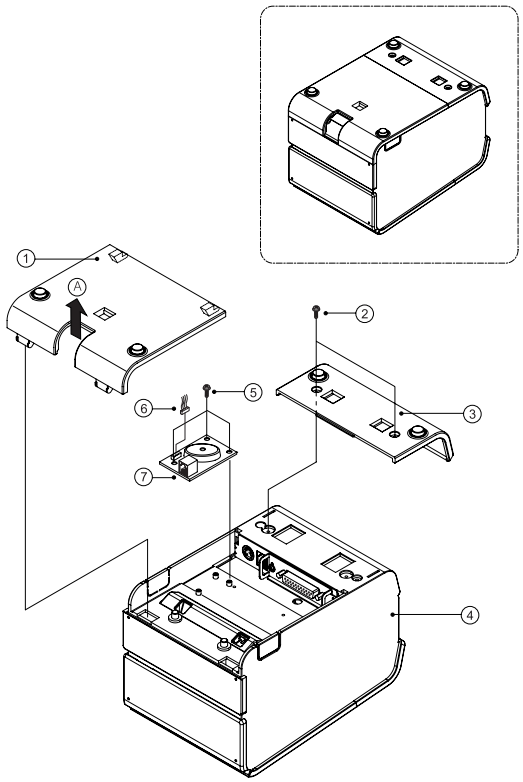
4.2 Case-Upper Block

4.3 Printer Block

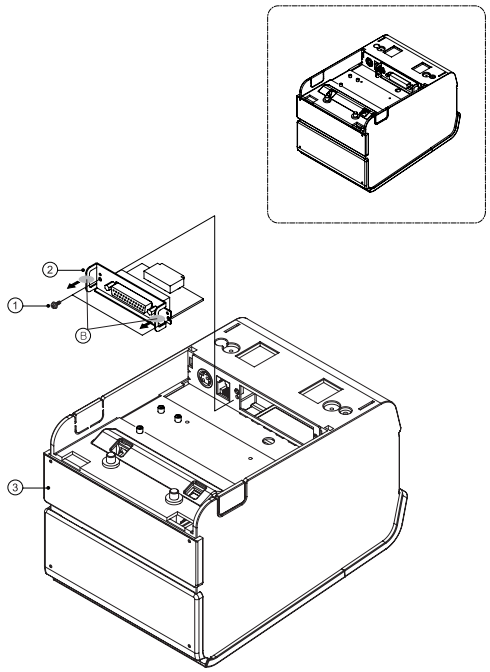
⚠CAUTION

- Before installation, be sure to turn off the power switch.
- Use gloves to protect your hand from being cut by the angle and the chassis.
- Connect all the cables correctly. When connecting or disconnecting the cables, be careful not to apply stress to the cables. (It may cause disconnection)
- Be careful not to bind interface cables and AC power cord together.
- To install, reverse the removal procedure.

4.1 Case-Lower Block

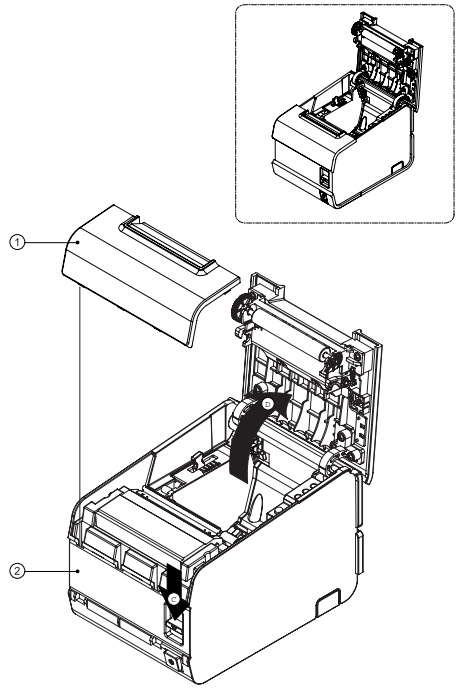


1. Turn the Printer upside down as shown.
2. Pull the rear Ⓐ of the Cover-Wire ① to separate from the Case-Lower ass'y ④.
3. Remove the two screws ② and pull the both sides of the Cover-Front ③ to separate from the Case-Lower ass'y ④.
4. Remove the Connector ⑥ from the Bell-PCB ⑦.
5. Remove the three screws ⑤ and remove the Bell-PCB ⑦ from the Case-Lower Ass'y ④.

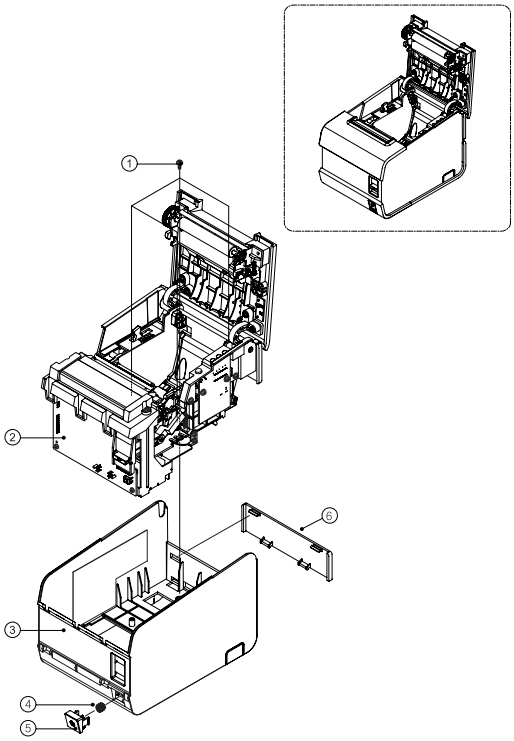


1. Remove the two screws ① and pull the two knobs Ⓑ of the BRKT-Parallel (or BRKT-Serial, BRKT-USB) ② to separate from the Case-Lower ass'y ③.
2. Remove the two screws ④.

4.1 Case-Lower Block - continue

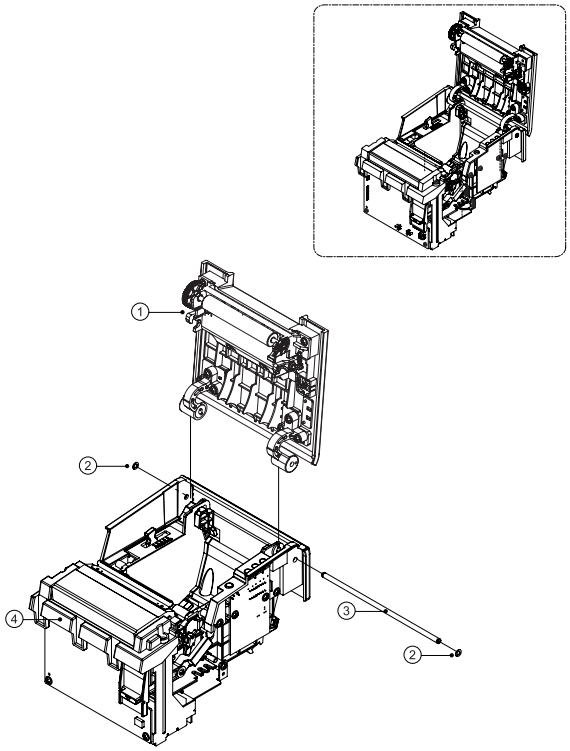


1. Push the Open-Button ⓒ and open the Cover-Open Ⓓ.
2. Pull the both sides of the Cover-Cutter ass'y ① to separate from the Case-Lower ass'y ②.

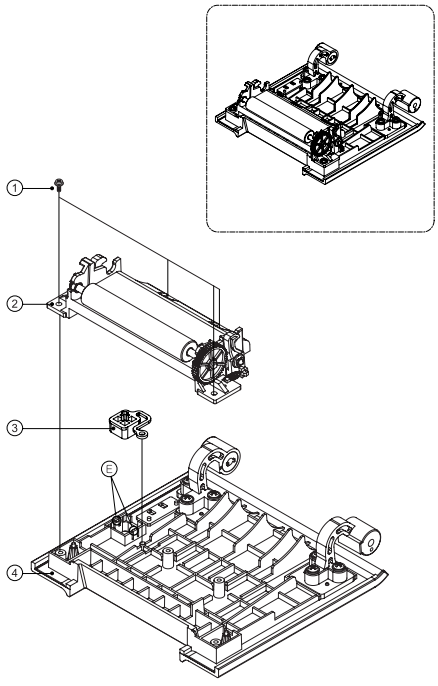


1. Remove the four screws ① and Lift the Case-Upper ass'y ② up to separate the Case-Lower ass'y ③.
2. Push the both hooks of the Cover-Rear ⑥ and separate from the Case-Lower ③.
3. Push the both hooks of the Power-Button ⑤ and separate from the Case-Lower ③.
4. Separate the spring ④ from the Power-Button ⑤.

4.2 Case-Upper Block

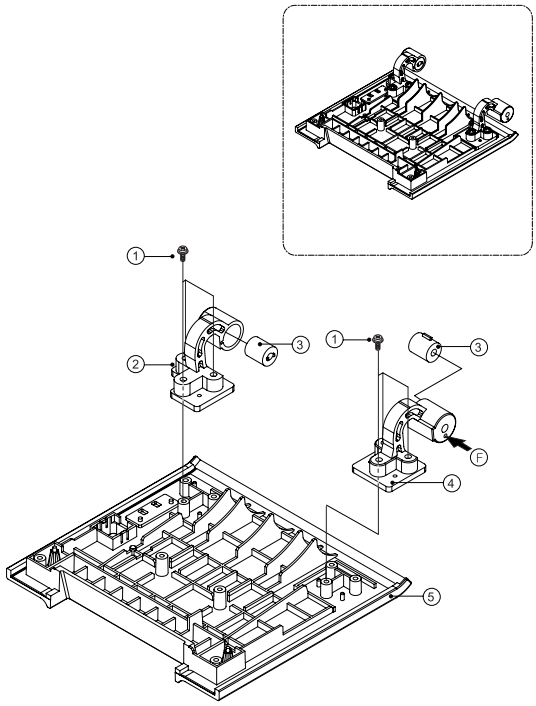


1. Remove the one of two Poly-Washers ② and pull the Shaft-Hinge ③ out in the opposite direction.
2. Lift the Cover-Open ass'y ① up in the normal direction to separate from the Case-Upper ass'y ④.

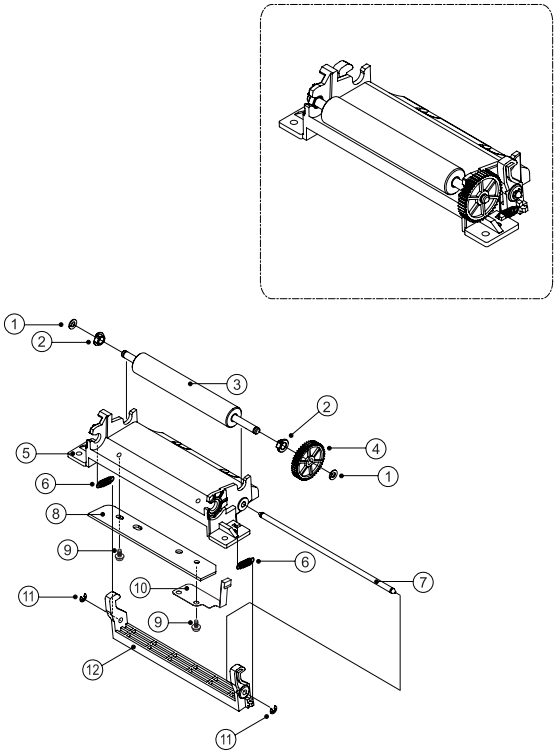


1. Remove the four screws ① and separate the Cover Holder ass'y ②.
2. Pull the two hooks Ⓔ out and simultaneously push the Feeding Button ③ to separate from the Cover-Open ass'y ④.

4.2 Case-Upper Block - continue

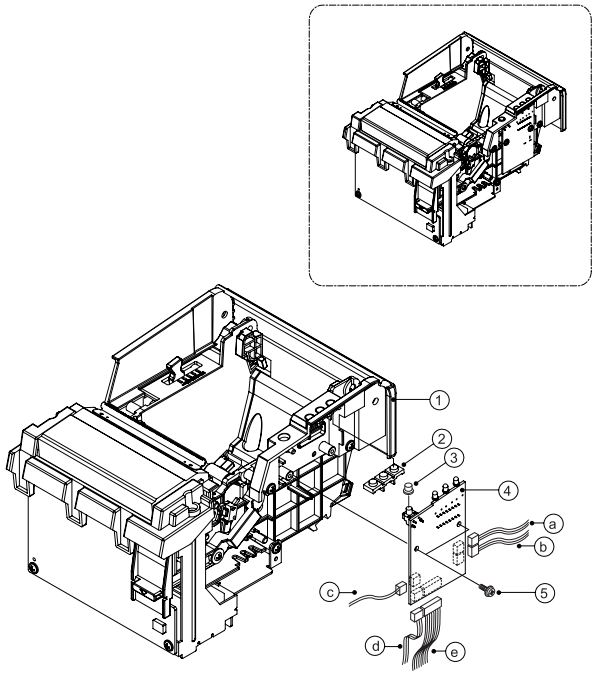


1. Remove the six screws ① and separate the Open-Arm Left ④ and Right ② from the Cover-Open ⑤.
2. Using a narrow pin, push the hole Ⓕ and separate the two Dampers ③.



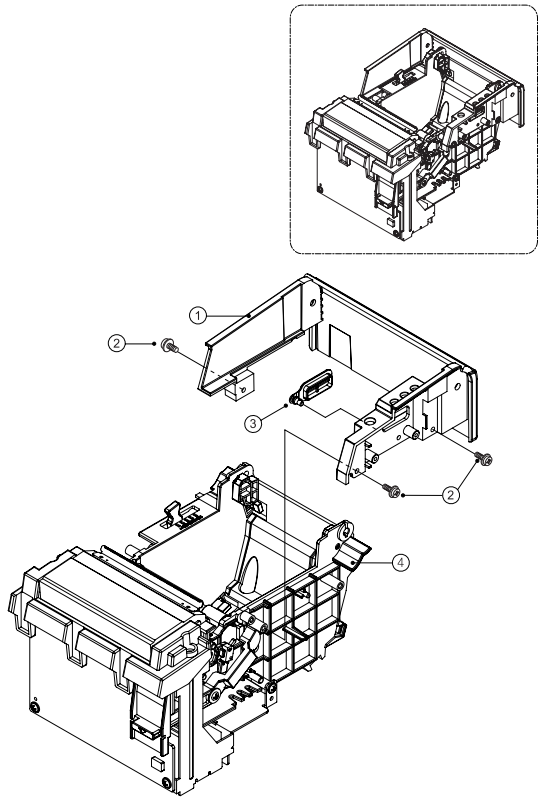
1. Remove the two Poly-Washers ① and separate the Gear-Roller ④, the two Bushings ② and the Platen-Roller ③ from the Cover-Holder ⑤.
2. Remove the two E-rings ⑪ and pull the Shaft-Holder ⑦ out from the Cover-Holder ⑤.
3. Separate the Holder-Lock ⑫ and the two Springs ⑥ from the Cover-Holder ⑤.
4. Remove the two screws ⑨ and separate the Cutter GND ⑩ and the Fixed-Cutter ⑧ from the Cover-Holder ⑤.

4.2 Case-Upper Block - continue



1. Remove the two screws ⑤ and separate the LED-Board ④, the Cover-LED ② and the Cap-Feed ③ from the Case-Upper ass'y ①.

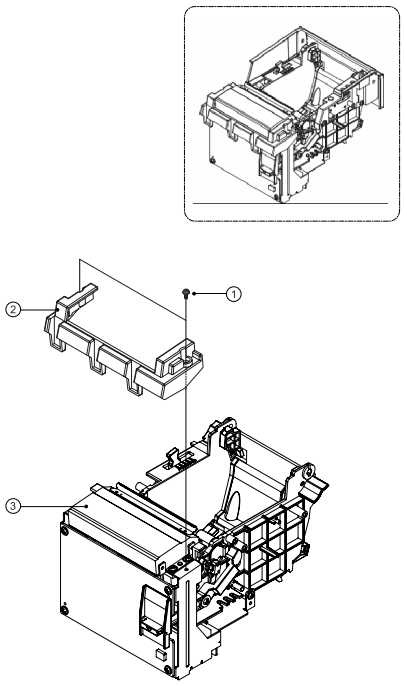
2. Separate the five harnesses ⓐⓑⓒⓓⓔ from the LED-Board ④.



1. Remove the three screws ② and separate the Case-Upper ① from the Printer ass'y ④.

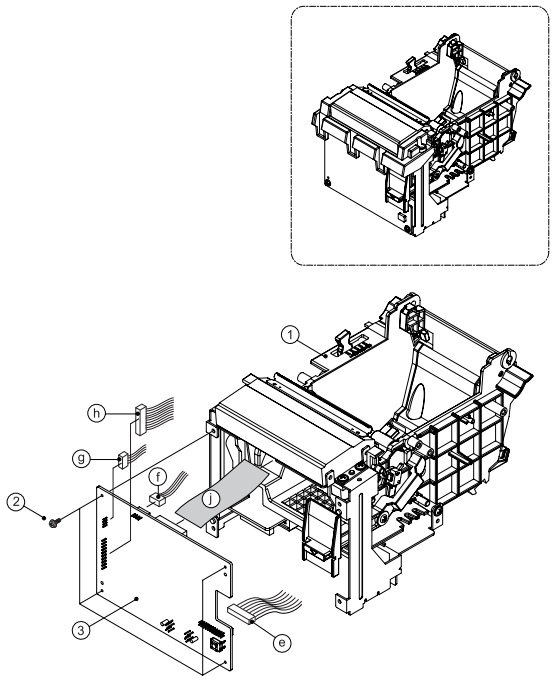
2. Pull the Cover-Dip SW ③ from the Case-Upper ①.

4.2 Case-Upper Block - continue



1. Remove the two screws ① and remove the Cover-Dummy ② from the Printer ass'y ③.

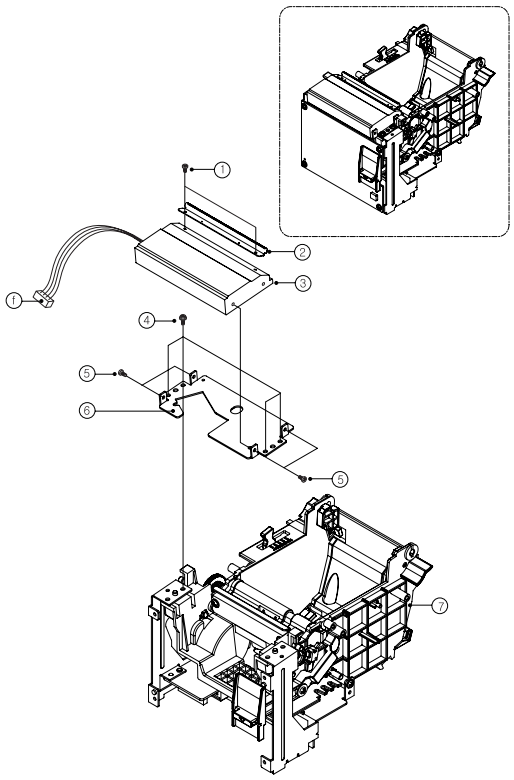
4.3 Printer Block



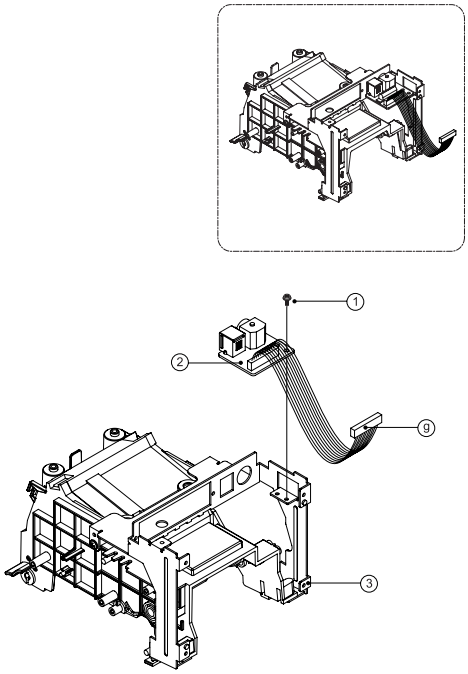
1. Remove the four screws ② and separate the Main-Board ③ from the Printer ass'y ①.

2. Separate the five harnesses ⓔⓕⓖⓗⓙ from the Main-Board ③.

4.3 Printer Block - continue

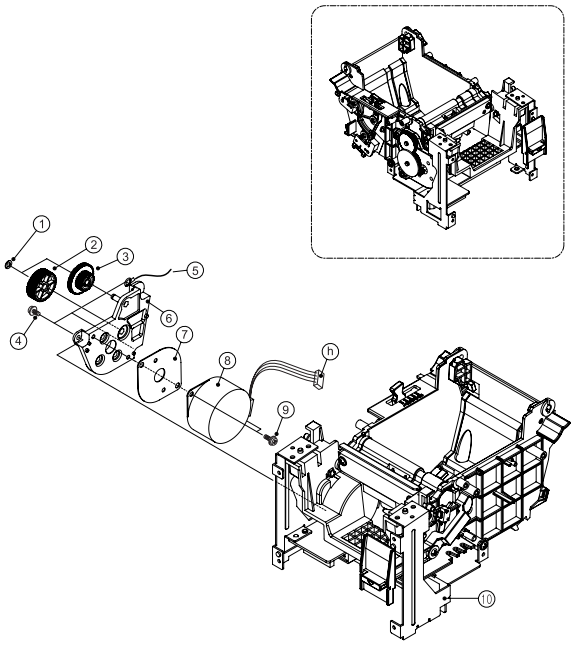


1. Remove the four screws ④ and separate the Unit-Cutter ③ from the Printer ass'y ⑦.
2. Remove the four screws ⑤ and separate the Holder-Cutter ⑥ from the Unit-Cutter ③.
3. Remove the two screws ① and separate the Manual-Cutter ② from the Unit-Cutter ③.

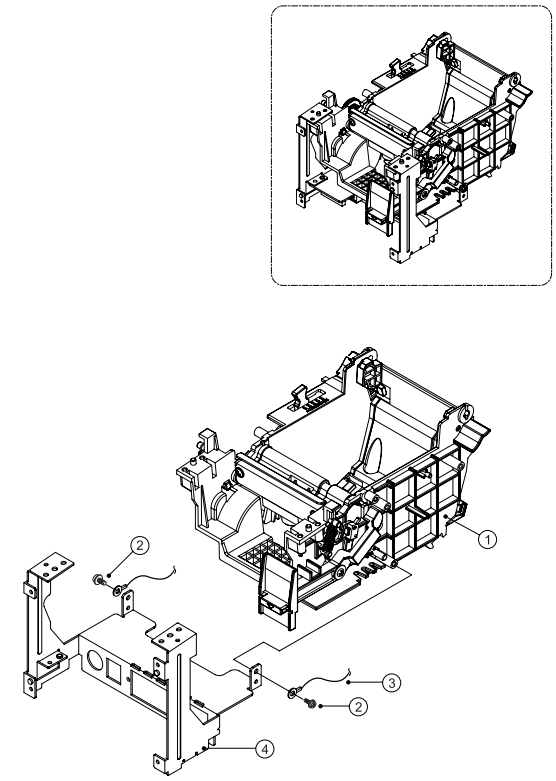


1. Turn the Printer upside down as shown.
2. Remove the screw ① and separate the Power-Board ② from the BRKT-Main ③.

4.3 Printer Block - continue

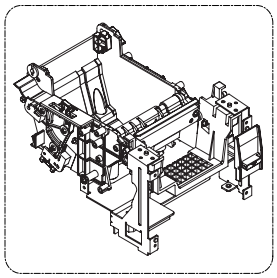


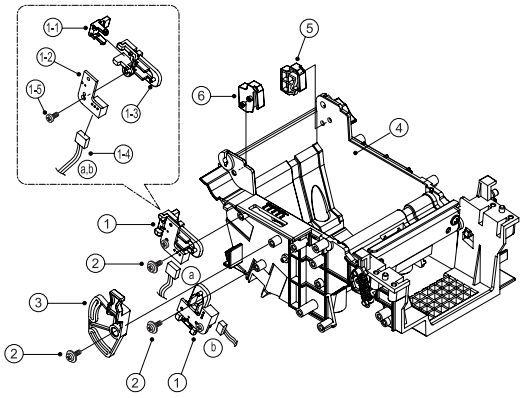
1. Remove the two Poly-Washers ① and separate the Gear-Idle ② and the Gear-Reduction ③ from the Housing ⑥.
2. Remove the three screws ④ and separate the GND wire ⑤ and the Housing-Motor ⑥ from the Printer ass'y ⑩.
3. Remove the two screws ⑨ and separate the Step-Motor ⑧ and the Damper ⑦ from the Housing ⑥.



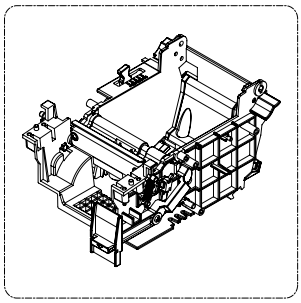
1. Remove the two screws ② and separate the GND wire ③ and the BRKT-Main ④ from the Printer ass'y ①.

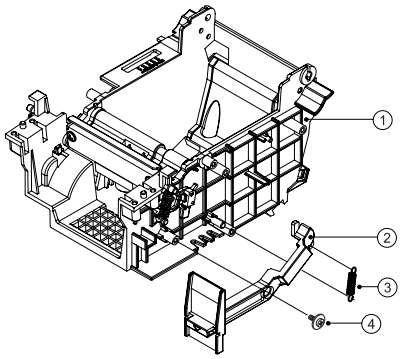
4.3 Printer Block - continue





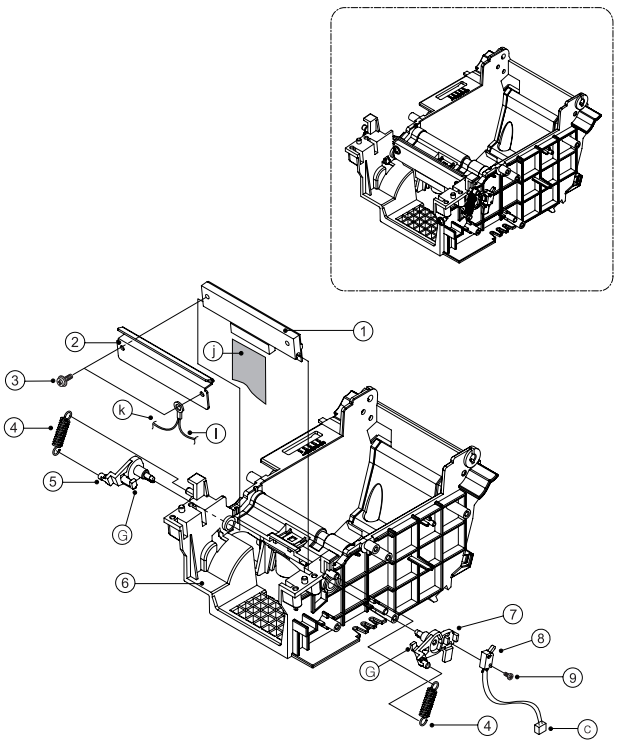
1. Pull the Guide-Paper Left ⑥ and Right ⑤ out to separate from the Printer ass'y ④.
2. Remove the three screws ② and separate the Lever ③ and the two Near-End ass'y ① from the Printer ass'y ④.
3. Separate the two harnesses ⓐⓑ from the two Near-End ass'y ① and the Printer ass'y ④.



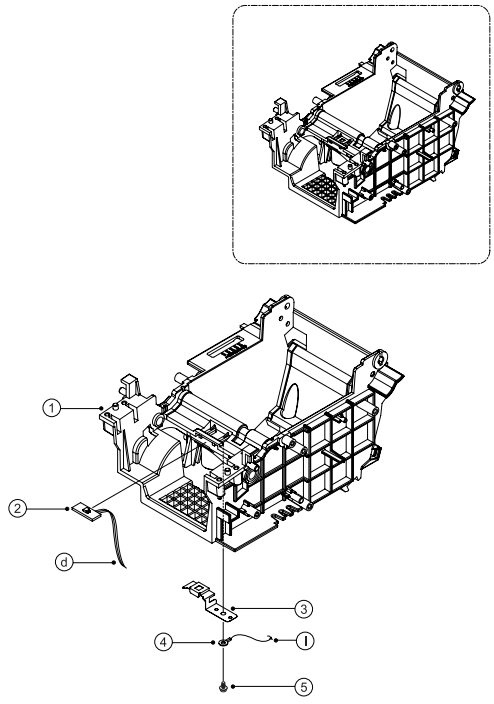


1. Remove the screw ④ and the Open-Button ② and the Spring ③ from the Printer ass'y ①.

4.3 Printer Block - continue

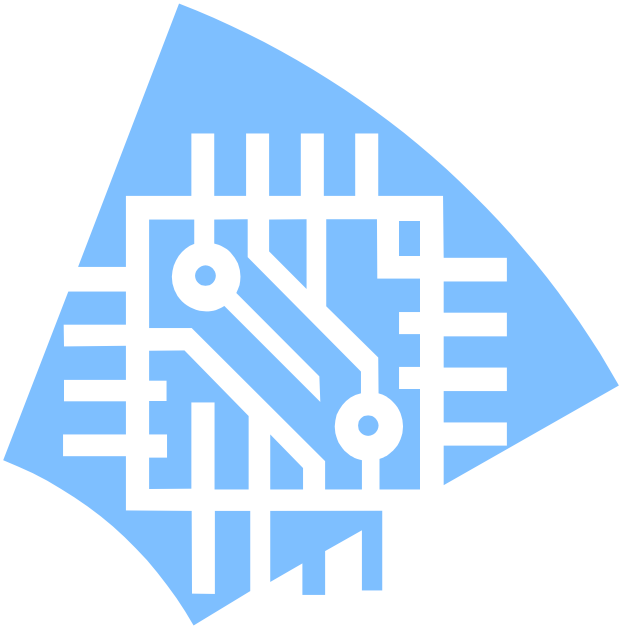


1. Separate the two Springs ④ from Paper-Supply ⑥ and pull the Lever-Left ⑤ and the Lever-Right ⑦ out to separate from the TPH ①. (Release the each hook Ⓖ and then pull it out.)
2. Remove the screw ⑨ and separate the Micro-Switch ⑧ from the Lever-Right ⑦.
3. Remove the two screws ③ and separate the GND wire ⓚⓁ and the BRKT-Head ② from the TPH ①.
4. Separate the TPH ① and the harness Ⓙ from the Main-Board.



1. Remove the screw ⑤ and separate the GND wire Ⓘ.
2. Separate the BRKT-Shield ③ and the Sensor ass'y ② from the Paper-Supply ①.

M E M O



Chapter 5

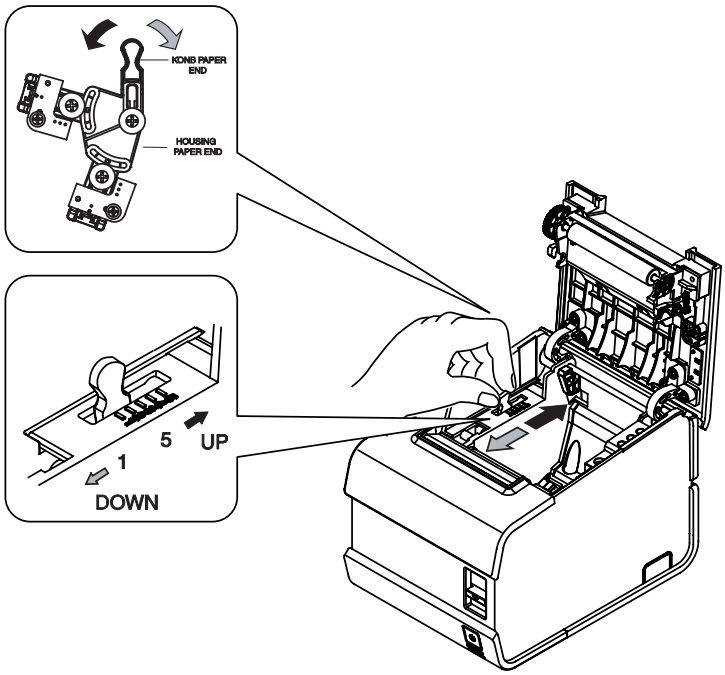
Maintenance and Adjustment

5.1 Adjustment
5.2 Maintenance

5.1 Adjustment

5.1.1 Adjustment Near-End Sensor

This sensor has five settings, which are scale #1,2,3,4 and 5. The NEAR END SENSOR is set to #3 positions at the factory. You can change the setting to adjustment scale #1,2,3,4 and 5 as described below.



1. Push the Open-Button and open the Cover open.
2. Change the setting to the scale #1,2,3,4 and 5.
3. If you find that there is too much paper remaining on the roll paper when the NEAR END SENSOR is triggered. Push the Knob Near End Sensor up to scale #4 or #5. Otherwise pull it down to scale #1 or #2 as illustrated figure 5-3.

The accuracy of the NEAR END SENSOR depends on the Adjustment Scale setting and the Winding Core Diameter Of the roll paper. The NEAR END SENSOR is set at Adjustment Scale #3. This is the appropriate scale for the recommended paper thickness.

IMPORTANT

The factory setting is based on a roll paper core with an outside diameter of 18mm.

5.1.1 Adjustment Near-End Sensor - continue

[Standard Paper Specification]

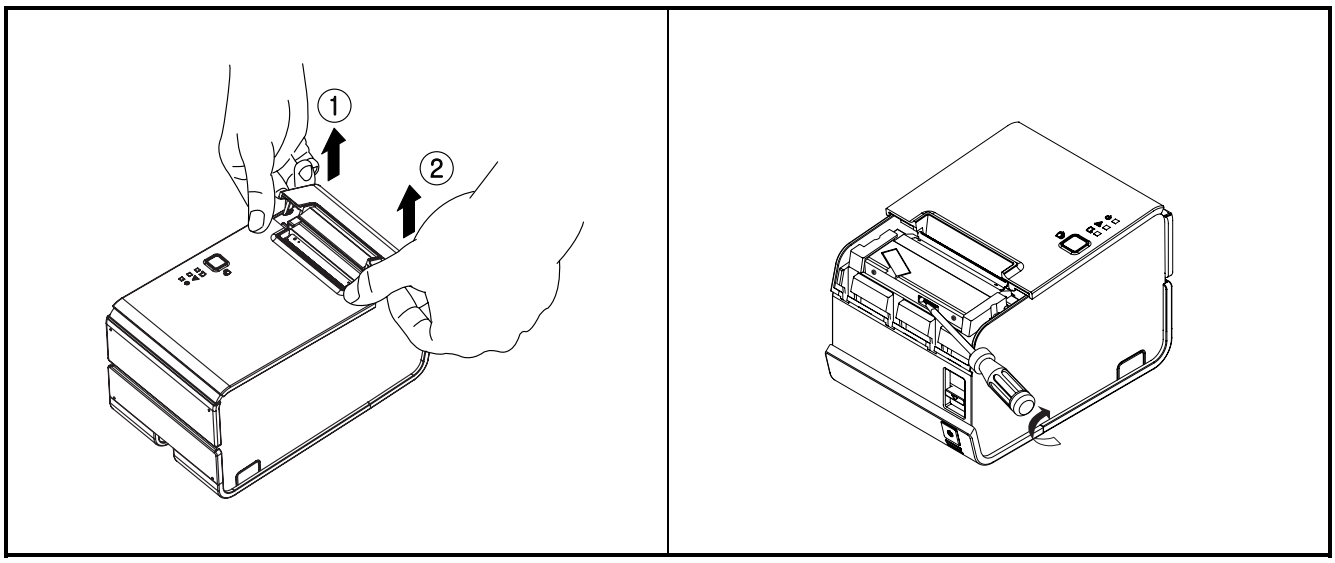
Item		Specification	Remark
Width		79.5 ±0.5	
Thickness		0.065	
Diameter (Roll Core)	In	ø12.0	
	Out	ø18.0	

⚠CAUTION

- When using roll paper other than recommended paper, the Thermal roll paper remnant lengths will be various.
- When using roll paper with a red mark, the Winding Core may pull out of its holder due to the paper sticking to Winding Core. If the Winding Core pulls out of its holder, the NEAR END SENSOR may indicate an inaccurate remnant length.

5.1.2 Paper Jam

If a foreign object such as a push pin or paper clip drops in the auto cutter and causes the auto cutter to lock up, the printer enters an error state. (The error LED will blink and Buzzer will beep regularly.)



1. Turn ELLIX20 power off by pressing the POWER BUTTON.
2. If the printer cover opens:

   Open the printer cover, remove the paper stuck and put the new paper roll in.

   If the printer cover does not open:

   Turn ELLIX20 power ON.

   ① Pull the cover cutter from right side and then left side.

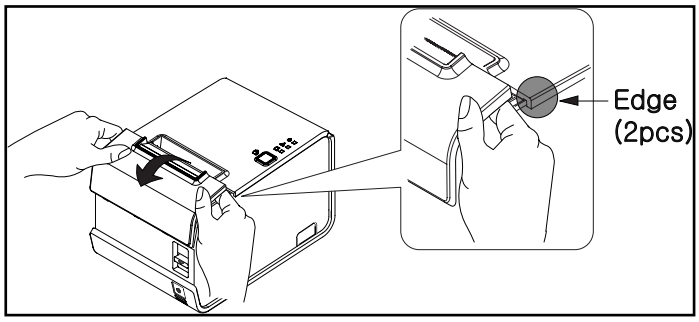
   ② Drive a motor worm gear until the buzzer stops ringing. (Turn the motor worm gear in a counterclockwise direction. If it does not work, please do it in the other way.)

   ③ Open the printer cover, remove the paper stuck and put the new paper roll in.

   ④ Turn ELLIX20 power off and then turn it on or send the DLE ENQ n in command.

⚠WARNING

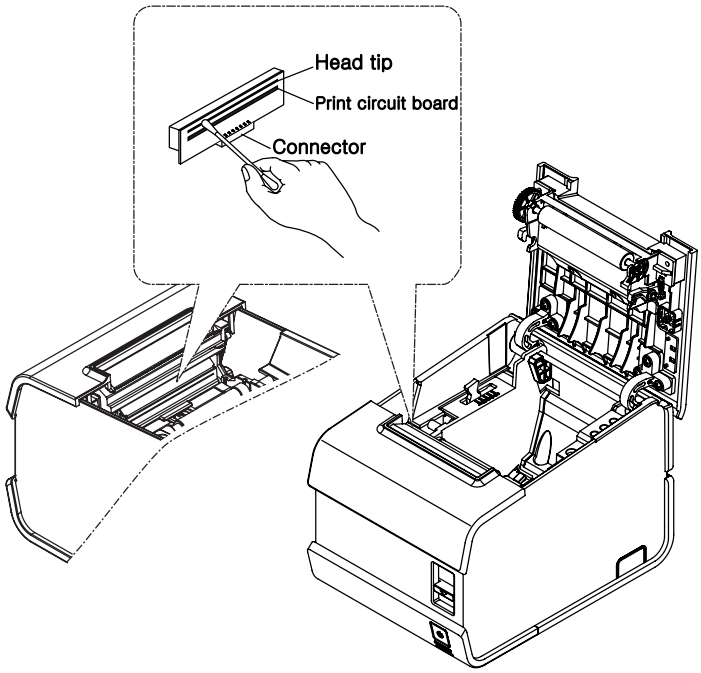
Be careful of the sharp edges of the printer cover.



5.2 Maintenance

5.2.1 Cleaning Head

Paper dust on the heating elements may lower the print quality. In this case, clean the print head as follows:

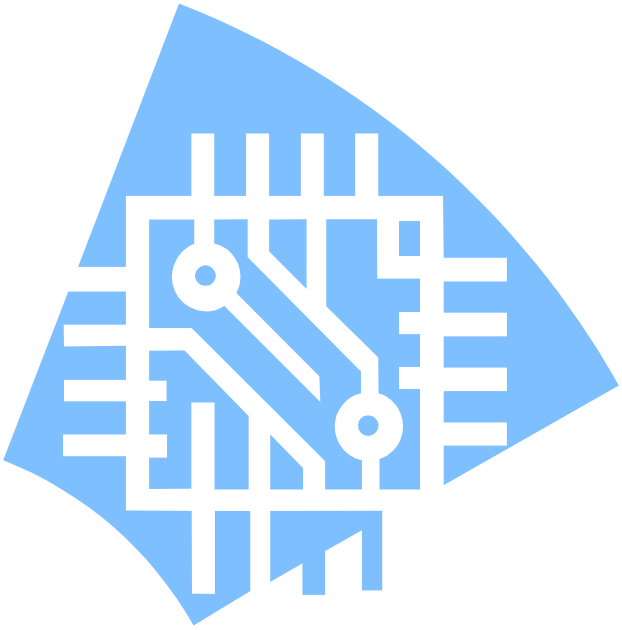


1. Push the Open-Button and open the Cover-Open.
2. Clean the thermal element (the area that looks like it is marked a thin black line) of the thermal head with a cotton swab moistened with an alcohol solvent (ethanol, methanol or IPA).
3. After confirming that the alcohol solvent has been dried up completely, close the Cover-Open.

⚠WARNING

- Turn off the printer power before cleaning.
- Note that the thermal head (Thermal Element and Radiation Plate) becomes very hot during normal operation, creating the danger of burn injury. But sure to wait for about 10 minutes after turning printer power off before beginning the cleaning.
- Never touch the thermal element with your hand. Doing so can damage the thermal element.
- Do not scratch the Printer Head.

M E M O

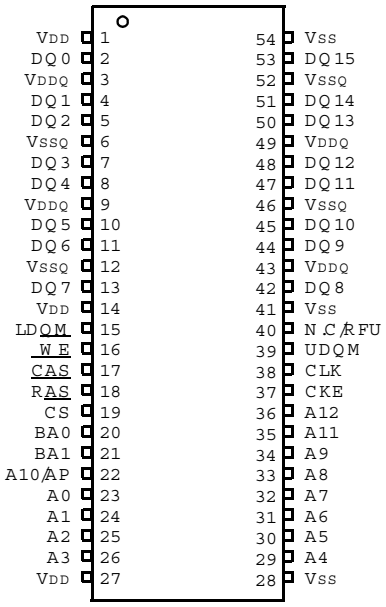


Chapter 6

Reference Information

6.1 SDRAM (K4S641632A) Diagram & Description
6.2 NOR FLASH MEMORY (A29L800UV) Diagram & Description
6.3 MOTOR DRIVER IC (MC34920EI) Diagram & Description
6.4 USB TO SERIAL IC (CY7C64013) Diagram & Description
6.5 Other ICs (SN74ACT245 / SN74LV14 / LM393D) Diagram & Description
6.6 Other ICs (74HC74 / 34063 / MAX232) Diagram & Description
6.7 Other ICs and TR, DIODE Diagram

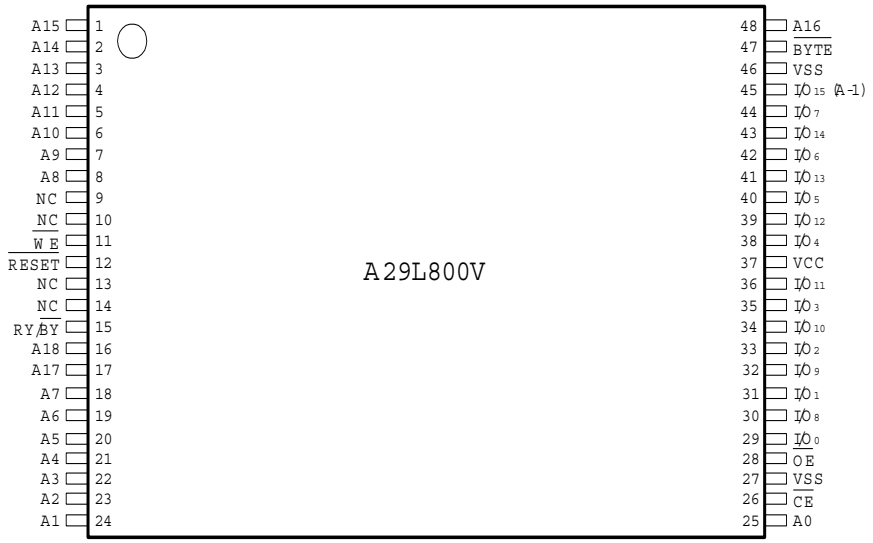
6.1 SDRAM (K4S641632A) Diagram & Description



56PIN TSOP(II)

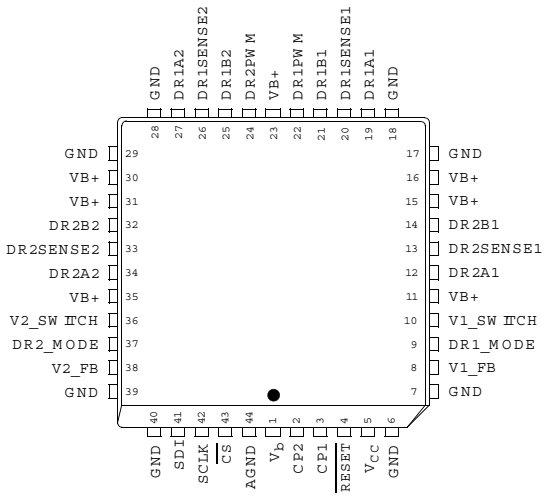
Signal Name	Description
CLK	Active on the positive going edge to sample all inputs
/CS	Disables or enables device operation.
CKE	Masks system clock to freeze operation from the next clock cycle.
A0 – A12	Row address : RA0 ~ RA12, Column address : CA0 ~ CA8
BA0 – BA1	Selects bank to be activated during row address latch time.
/RAS	Latches row addresses on the positive going edge of the CLK with RAS low.
/CAS	Latches column addresses on the positive going edge of the CLK with CAS low.
/WE	Enables write operation and row precharge.
L(U)DQM	Makes data output Hi-Z, tSHZ after the clock and masks the output.
DQ0 – DQ15	Data inputs/outputs are multiplexed on the same pins.
VDD/VSS	Power and ground for the input buffers and the core logic.
VDDQ/VSSQ	Isolated power supply and ground.
N.C / RFU	This pin is recommended to be left No Connection on the device.

6.2 NOR FLASH MEMORY (A29L800UV) Diagram & Description



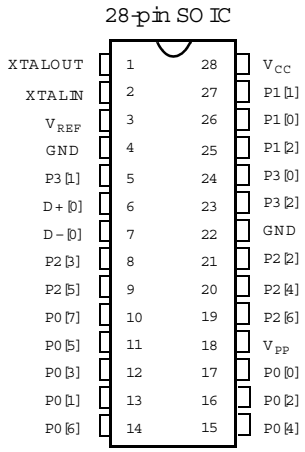
Signal Name		Description
A0 - A18\		Address Inputs
I/O0 - I/O14		Data Inputs/Outputs
I/O15	I/O15	Data Input/Output, Word Mode
(A-1)	A-1	LSB Address Input, Byte Mode
/CE		Chip Enable
/WE		Write Enable
/OE		Output Enable
/RESET		Hardware Reset
/BYTE		Selects Byte Mode or Word Mode
/RY_BY		Ready/BUSY- Output
VSS		Ground
VCC		Power Supply (+2.7V ~+3.6V)
N.C		Pin not connected internally

6.3 MOTOR DRIVER IC (MC34920EI) Diagram & Description



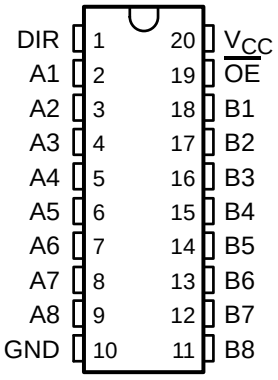
Signal Name	Description	Signal Name	Description
Vb	Terminal to connect to VVb capacitor.	DR1PWM	PWM input for Driver 1.
CP2	Terminal for boost generator switch capacitor.	DR2PWM	PWM input for Driver 2.
CP1	Terminal for boost generator switch capacitor.	DR1B2	Motor driver output.
/RESET	Active low Reset output.	DR1SENSE2	Current sense for current mode.
VCC	Power input for internal use.	DR1A2	Motor driver output.
GND	Connections for digital IC circuitry.	DR2B2	Motor driver output.
V1_FB	Voltage feedback for the V1 regulator.	DR2SENSE2	Current sense for current mode.
DR1_MODE	Selects operational mode of Driver1.	DR2A2	Motor driver output.
V1_SWITCH	Switching output for V1 regulator.	V2_SWITCH	Switching output for V2 regulator.
VB+	High-voltage supply for motors and regulators.	DR2_MODE	Selects operational mode of Driver 2.
DR2A1	Motor driver output.	V2_FB	Switch output for V2 regulator.
DR2SENSE1	Current sense for current mode.	SDI	Serial input register serial data input.
DR2B1	Motor driver output.	SCLK	Serial input register clock.
DR1A1	Motor driver output.	/CS	Serial input register chip select input.
DR1SENSE1	Current sense for current mode.	AGND	Ground connection for analog circuitry.
DR1B1	Motor driver output.	-	-

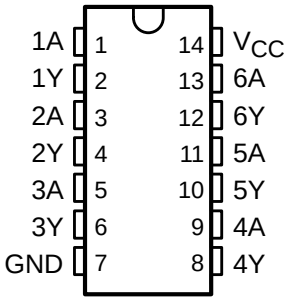
6.4 USB TO SERIAL IC (CY7C64013) Diagram & Description



Signal Name	Description
D+[0] , D-[0]	Upstream port, USB differential data.
P0	GPIO Port 0 capable of sinking 7 mA (typical).
P1	GPIO Port 1 capable of sinking 7 mA (typical).
P2	GPIO Port 2 capable of sinking 7 mA (typical). HAPI is also supported through P2[6:2].
P3	GPIO Port 3, capable of sinking 12 mA (typical).
DAC	DAC Port with programmable current sink outputs. DAC[1:0] offer a programmable range of 3.2 to 16 mA
XTAL IN	6-MHz crystal or external clock input.
XTAL OUT	6-MHz crystal out.
Vpp	Programming voltage supply, tie to ground during normal operation.
Vcc	Voltage supply.
GND	Ground.
Vref	External 3.3V supply voltage for the differential data output buffers and the D+ pull-up.
N.C	No Connect.

6.5 Other ICs (SN74ACT245 / SN74LV14 / LM393D) Diagram & Description

<table>
<tr><th>Diagram</th><th>Function</th></tr>
<tr><td>


SN74ACT245
</td><td>
<table>
<tr><th colspan="2">Input</th><th rowspan="2">OPERATION</th></tr>
<tr><th>/OE</th><th>DIR</th></tr>
<tr><td>L</td><td>L</td><td>B data to A bus</td></tr>
<tr><td>L</td><td>H</td><td>A data to B bus</td></tr>
<tr><td>H</td><td>X</td><td>Isolation</td></tr>
</table>
</td></tr>
<tr><td>


SN74LV14
</td><td>
<table>
<tr><th>Input(A)</th><th>Output(Y)</th></tr>
<tr><td>H</td><td>L</td></tr>
<tr><td>L</td><td>H</td></tr>
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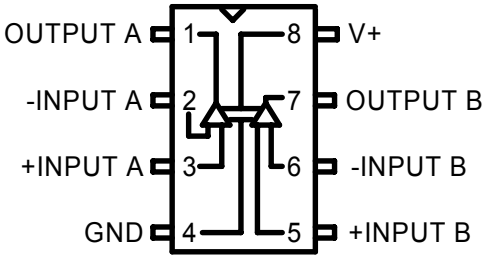
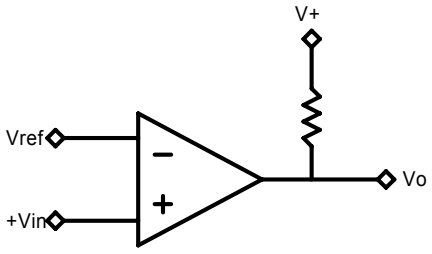
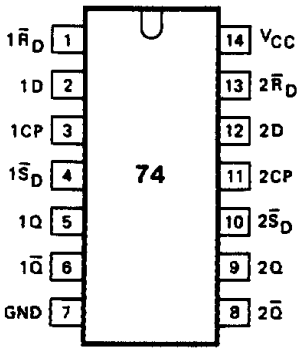
</td></tr>
<tr><td>


LM393D
</td><td>


<table>
<tr><th>Input</th><th>Output</th></tr>
<tr><td>+Vin > Vref</td><td>Vo = +V</td></tr>
<tr><td>+Vin < Vref</td><td>Vo = GND</td></tr>
</table>
</td></tr>
</table>

6.6 Other ICs (74HC74 / 34063/ MAX232) Diagram & Description

Diagram

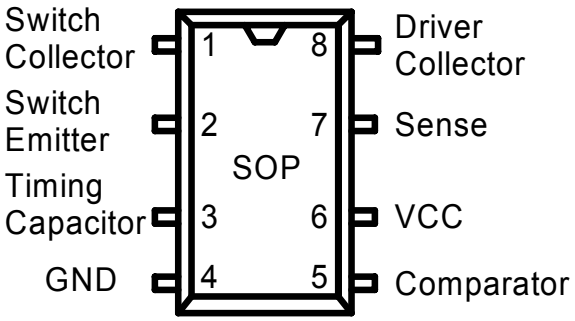


74HC74

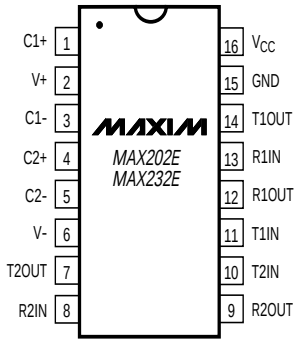
INPUTS				OUTPUTS	
$\overline{S}_D$	$\overline{R}_D$	CP	D	Q	$\overline{Q}$
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H	H

INPUTS				OUTPUTS	
$\overline{S}_D$	$\overline{R}_D$	CP	D	Q_{n+1}	$\overline{Q}_{n+1}$
H	H	↑	L	L	H
H	H	↑	H	H	L

FUNCTION TABLE

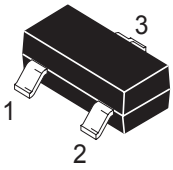
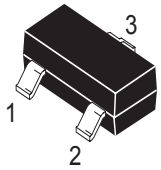
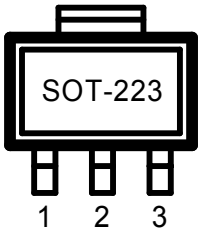
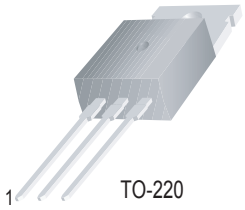
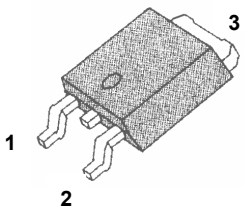


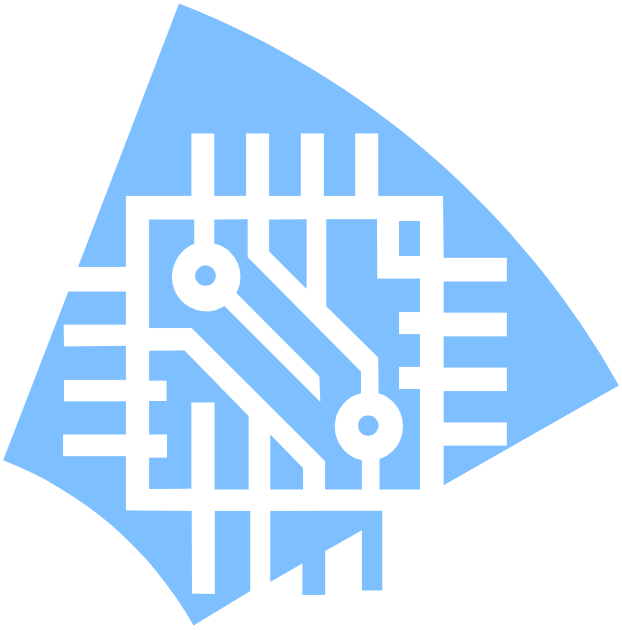
34063



MAX232

6.7 Other ICs and TR, DIODE Diagram

Diagram	
SOT-23  1:Anode 2:N.C 3:Cathode MMDB6050	SOT-23  1:B 2:E 3:C MMBT2222A
 1: ADJ/GND 2:Vout 3:Vin AME1117ACGT	 1:B 2:C 3:E KSD288
 1: GATE 2:SOURCE 3:DRAIN IRFR9024	



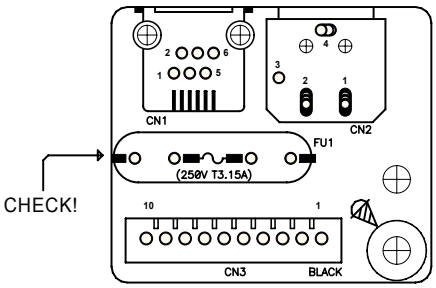
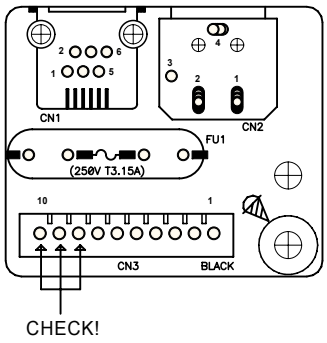
Chapter 7

Troubleshooting

7.1 Power Problem
7.2 System Problem
7.3 Thermal Printer and Feed Motor Problem
7.4 LED B'D and Sensor Problem
7.5 Drawer Problem
7.6 RS-232C Interface Problem
7.7 RS-485 Interface Problem
7.8 IEEE-1284 Parallel Interface Problem
7.9 USB Interface Problem
7.10 Ethernet Interface Problem

7.1 Power Problem

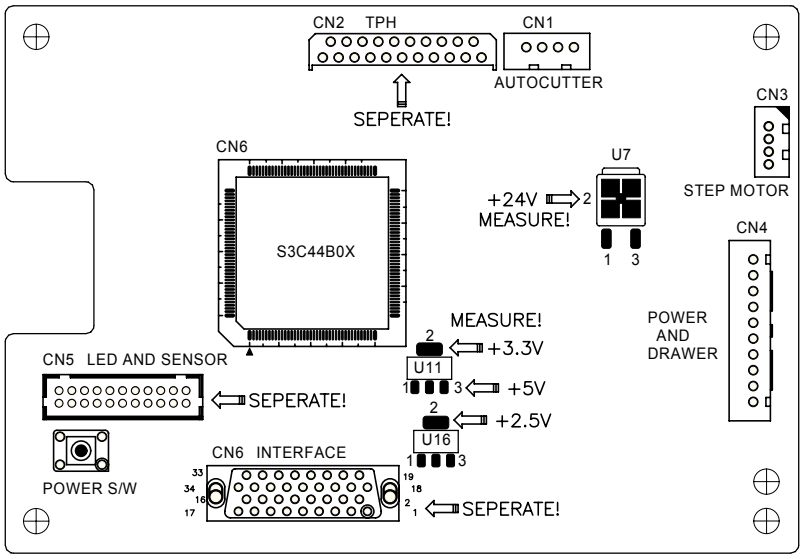
7.1.1 Verifying the Power Supply

NO	METHODE	REMARK
1	• Checking AC power cord.	
2	 • Checking the fuse on the Power B'D.	
3	 • Separate the power cable between Main B'D and Power B'D. And measure the DC output voltage (+24V) on Power B'D. (CN3 : Pin Number 8,9,10)	

⚠DANGER

During servicing & repairing, Be careful against receiving an electric-shock.

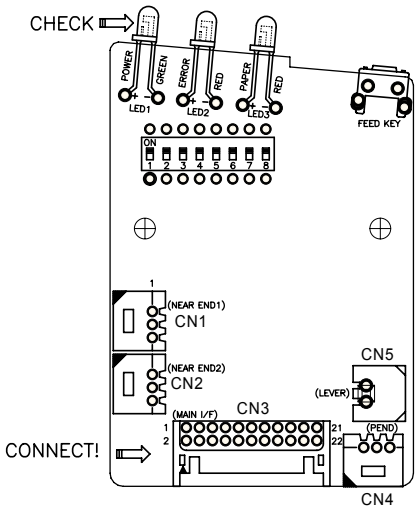
7.1.2 Verifying the Main B'D Power Line

NO	METHODE	REMARK
1	• Power "OFF"	
2	 • Separate the TPH cable , LED B'D cable and I/F PBA	
3	• Power "ON" and measure the DC Output Voltage. +24V : IRFR9024(U17) Pin Num 2 +5V :AME1117(U11) Pin Num 3 +3.3V :AME1117(U11) Pin Num 2 +2.5V :AME1117(U10) Pin Num 2	

⚠DANGER

During servicing & repairing, Be careful against receiving an electric-shock.

7.1.3 Verifying the LED B'D Power Line

NO	METHODE	REMARK
1	• Power "OFF"	
2	• Connect the LED B'D cable.	
3		
	• Power "ON" and Check the Power LED (GREEN).	

7.1.4 Verifying the TPH Logic Power Line

NO	METHODE	REMARK
1	• Power "OFF"	
2	• Connect the TPH FPC cable.	
3	• Power "ON" and measure the TPH Logic Voltage. (VCC) +5V : AME1117(U11) Pin Num 3 on Main B'D	

7.1.5 Verifying the I/F B'D Power Line

NO	METHODE	REMARK
1	• Power "OFF"	
2	• Connect the I/F PBA.	
3	• Power "ON" and measure the I/F Logic Voltage. (VCC) +5V : AME1117(U11) Pin Num 3 on Main B'D	

⚠DANGER

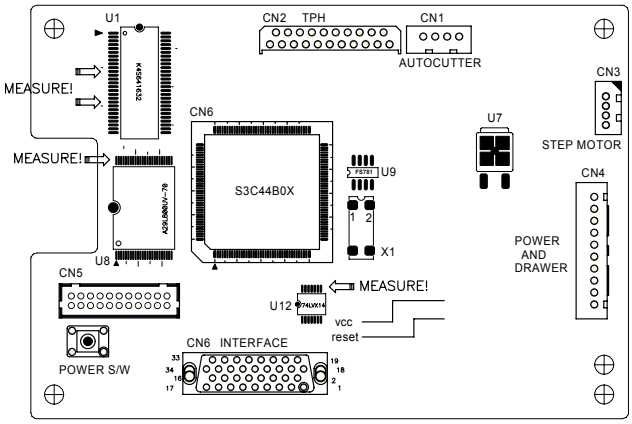
During servicing & repairing, Be careful against receiving an electric-shock.

7.2 System problem

7.2.1 System Clock Problem

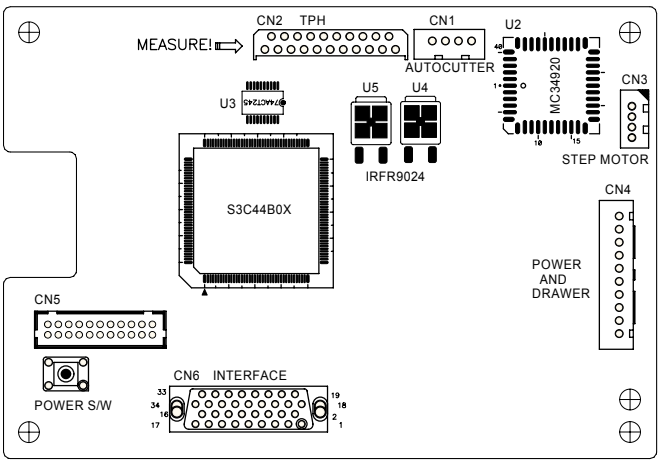
NO	METHODE	REMARK
1	• Measure X-TAL (X1) Output. (12Mhz) 12Mhz : X-TAL Pin Num 1	**Set Power ON**
2	• Measure EMI Spectrum Spread Clock IC Output. (12Mhz) 12Mhz : FS781(U9) Pin Num 6	
3	• Measure PLL Output Clock. (60Mhz) 60Mhz : SDRAM(U1) Pin Num 38	

7.2.2 System Signal Problem

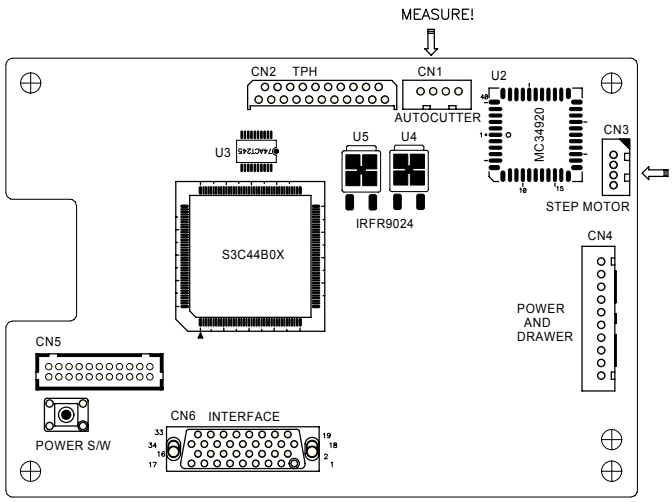
NO	METHODE	REMARK
1	 • Measure Reset Signal (Active Low) Reset : 74LVX14(U12) Pin Num 12	**Set Power ON**
2	• Measure The System Signals. (/GCS0 , /GCS6 , /OE , /WE) /GCS0 : Flash Memory A29L800UV(U8) Pin Num 26 /OE : Flash Memory A29L800UV(U8) Pin Num 28 /WE : SDRAM K4S561632(U1) Pin Num 16 /GCS6 : SDRAM K4S561632(U1) Pin Num 19	

7.3 Thermal Printer and Feed Motor problem

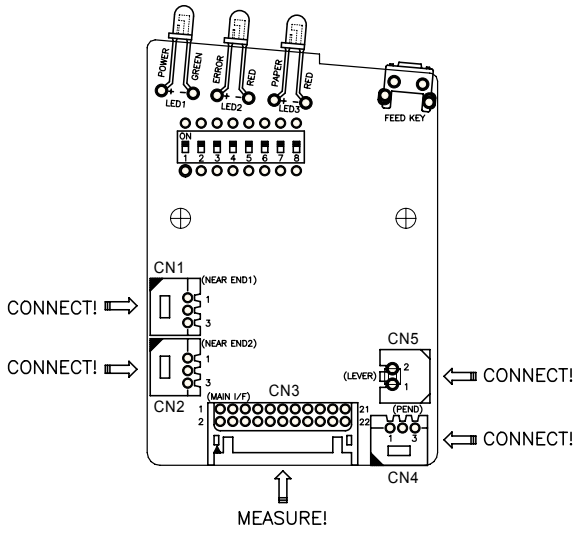
7.3.1 TPH Problem

NO	METHODE	REMARK
1	 • Print Start and Measure the TPH Voltage Source. (+24V) TPH Voltage : TPH Connector (CN2) Pin Num 1,3,17,19,21	**Set Power ON**
2	• Measure The TPH Control Signals. (PCLK, PDATA, /STB#1, /STB#2, PLATCH) PCLK : TPH Connector (CN2) Pin Num 11 PDATA : TPH Connector (CN2) Pin Num 13 /STB#1 : TPH Connector (CN2) Pin Num 9 /STB#2 : TPH Connector (CN2) Pin Num 10 PLATCH : TPH Connector (CN2) Pin Num 7	

7.3.2 Step Motor and Auto Cutter Problem

NO	METHODE	REMARK
1	 • Measure The Motor Driver IC MC34920 (U2) Control Signals. (SCLK , SDI , /CS) SCLK : MC34920 (U2) Pin Num 42 SDI : MC34920 (U2) Pin Num 41 /CS : MC34920 (U2) Pin Num 43	**Set Power ON**
2	• Measure The Step Motor Phase Signals. STEPMOT_/B : Step Motor Connector(CN3) Pin Num 1 STEPMOT_/A : Step Motor Connector(CN3) Pin Num 2 STEPMOT_B : Step Motor Connector(CN3) Pin Num 3 STEPMOT_A : Step Motor Connector(CN3) Pin Num 4	
3	• Measure The Auto Cutter Output Signals. AUTOCUT- : Auto Cutter Connector(CN1) Pin Num 1 AUTOCUT+ : Auto Cutter Connector(CN1) Pin Num 2 AUTOCUT_IN : Auto Cutter Connector(CN1) Pin Num 3	

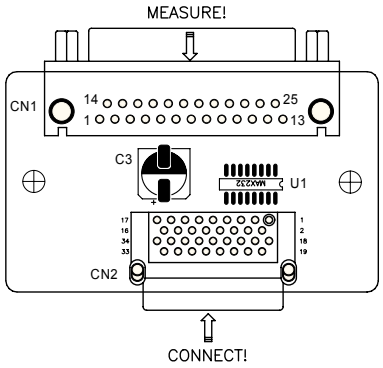
7.4 LED B'D and Sensor problem

NO	METHODE	REMARK
1	 • Measure the Paper End Signal State. (Paper Error : HIGH) Paper End : Main I/F Connector(CN3) Pin Num 14	**Set Power ON**
2	• Measure the Near End Signal. (Detect Near End : LOW) Near End : Main I/F Connector(CN3) Pin Num 2	
3	• Measure the Cover Open Signal. (Cover Open : HIGH) Cover Open : Main I/F Connector(CN3) Pin Num 21	
4	• Measure the Feed Key Signal. (Pressed Feed Key : LOW) Feed : Main I/F Connector(CN3) Pin Num 16	
5	• Measure the Dip Switch Signal. (Switch ON : LOW) Dip Switch1 : Main I/F Connector(CN3) Pin Num 1 Dip Switch2 : Main I/F Connector(CN3) Pin Num 4 Dip Switch3 : Main I/F Connector(CN3) Pin Num 3 Dip Switch4 : Main I/F Connector(CN3) Pin Num 6 Dip Switch5 : Main I/F Connector(CN3) Pin Num 5 Dip Switch6 : Main I/F Connector(CN3) Pin Num 8 Dip Switch7 : Main I/F Connector(CN3) Pin Num 7 Dip Switch8 : Main I/F Connector(CN3) Pin Num 10	

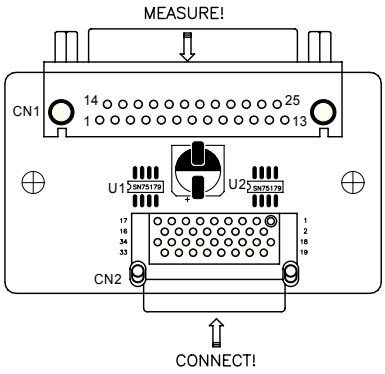
7.5 Drawer Problem

NO	METHODE	REMARK
1	• Measure the Drawer Signals State. (Drawer#1 , Drawer#2) Drawer#1 : Power and Drawer Connector (CN4) Pin Num 4 Drawer#2 : Power and Drawer Connector (CN4) Pin Num 6	**Set Power ON**
2	• Measure the Compulsory Signal. Compulsory : Power and Drawer Connector (CN4) Pin Num 5	

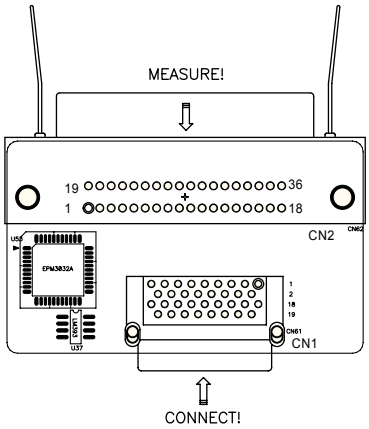
7.6 RS-232C Interface Problem

NO	METHODE	REMARK
1	 • Measure the RS232 I/F B'D Voltage Source. (VCC) VCC : Main Interface Connector (CN2) Pin Num 16	**Set Power ON**
2	• Connect RS232 Cable. (Host Device) • Measure the RS232 Communication Signals (Logic Level). TXD : Main Interface Connector (CN2) Pin Num 19 RXD : Main Interface Connector (CN2) Pin Num 21 DSR : Main Interface Connector (CN2) Pin Num 22 DTR : Main Interface Connector (CN2) Pin Num 20	**Data Send Or Receive**
3	• Measure the RS232 Communication Signals (Driver Level). TXD : RS232 DSUB25 Connector (CN1) Pin Num 2 RXD : RS232 DSUB25 Connector (CN1) Pin Num 3 DSR : RS232 DSUB25 Connector (CN1) Pin Num 6 DTR : RS232 DSUB25 Connector (CN1) Pin Num 20	

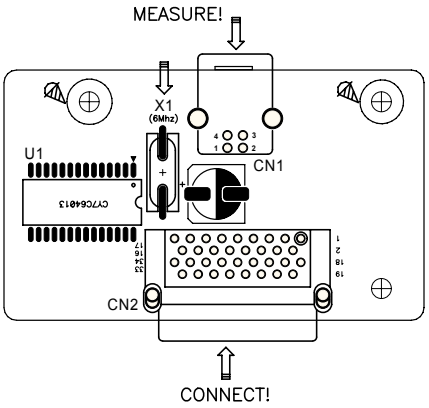
7.7 RS-485 Interface Problem

NO	METHODE	REMARK
1	 • Measure the RS485 I/F B'D Voltage Source. (VCC) VCC : Main Interface Connector (CN2) Pin Num 16	**Set Power ON**
2	• Connect RS485 Cable. (Host Device) • Measure the RS485 Communication Signals (Logic Level). TXD : Main Interface Connector (CN2) Pin Num 19 RXD : Main Interface Connector (CN2) Pin Num 21 DSR : Main Interface Connector (CN2) Pin Num 22 DTR : Main Interface Connector (CN2) Pin Num 20	**Data Send Or Receive**
3	• Measure the RS485 Communication Signals (Driver Level). TXD+ : RS485 DSUB25 Connector (CN1) Pin Num 3 RXD+ : RS485 DSUB25 Connector (CN1) Pin Num 5 DSR+ : RS485 DSUB25 Connector (CN1) Pin Num 11 DTR+ : RS485 DSUB25 Connector (CN1) Pin Num 9 TXD- : RS485 DSUB25 Connector (CN1) Pin Num 2 RXD- : RS485 DSUB25 Connector (CN1) Pin Num 4 DSR- : RS485 DSUB25 Connector (CN1) Pin Num 10 DTR- : RS485 DSUB25 Connector (CN1) Pin Num 8	

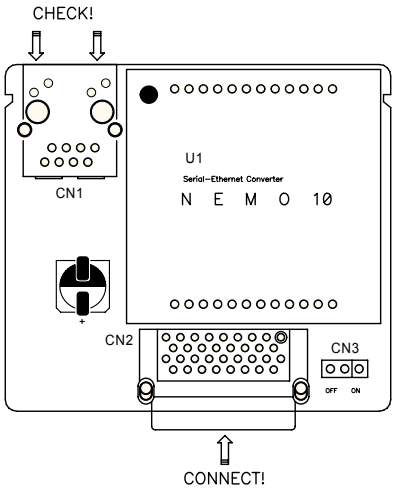
7.8 IEEE-1284 Parallel Interface Problem

NO	METHODE	REMARK
1	 • Measure the PARALLEL I/F B'D Voltage Source. (VCC and +3.3V) VCC : Main Interface Connector (CN1) Pin Num 16 +3.3V : Main Interface Connector (CN1) Pin Num 27	**Set Power ON**
2	• Connect PARALLEL Cable. (Host Device) • Measure the PARALLEL Communication Signals (Logic Level). STB : Centronics 36P Connector (CN2) Pin Num 1 BUSY : Centronics 36P Connector (CN2) Pin Num 11 Data[0~7] : Centronics 36P Connector (CN2) Pin Num 2~9 IRQ : Main Interface Connector (CN1) Pin Num 17	**Data Send** **Or** **Receive**

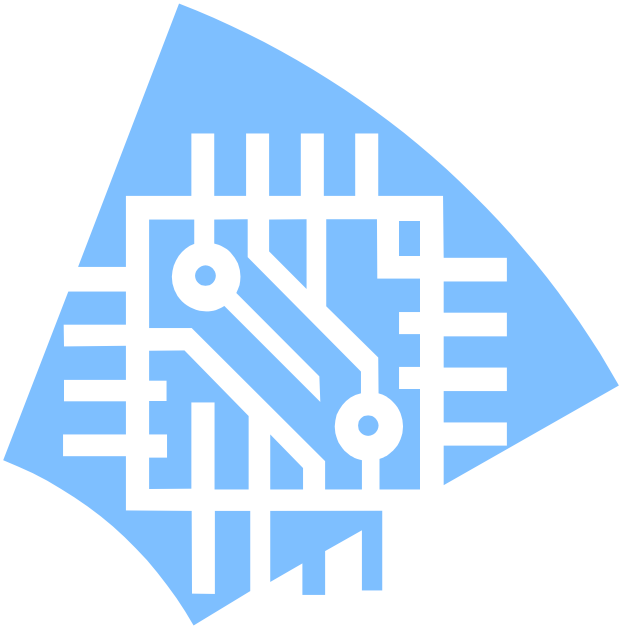
7.9 USB Interface Problem

NO	METHODE	REMARK
1	 • Measure the USB I/F B'D Voltage Source. (VCC and +3.3V) VCC : Main Interface Connector (CN2) Pin Num 16 +3.3V : Main Interface Connector (CN2) Pin Num 27	**Set Power ON**
2	• Measure the USB Driver IC Clock (6Mhz). X-TAL : USB Driver IC(U1) Pin Num 2	
3	• Connect USB Cable. (Host Device) • Measure the USB Communication Signals. TXD : Main Interface Connector (CN2) Pin Num 19 RXD : Main Interface Connector (CN2) Pin Num 21 DSR : Main Interface Connector (CN2) Pin Num 22 DTR : Main Interface Connector (CN2) Pin Num 20	**Data Send** **Or** **Receive**
4	• Measure the USB Communication Driver Signals. USB_D+: USB Connector (CN1) Pin Num 3 USB_D- : USB Connector (CN1) Pin Num 2	

7.10 Ethernet Interface Problem

NO	METHODE	REMARK
1	 • Measure the ETHERNET I/F B'D Voltage Source. (VCC) VCC : Main Interface Connector (CN2) Pin Num 16	**Set Power ON**
3	• Connect the LAN Cable. (Host Device) • Measure the USB Communication Signals. TXD : Main Interface Connector (CN2) Pin Num 19 RXD : Main Interface Connector (CN2) Pin Num 21 DSR : Main Interface Connector (CN2) Pin Num 22 DTR : Main Interface Connector (CN2) Pin Num 20	**Data Send** **Or** **Receive**
4	• Check the "Link / Act LED".	

M E M O

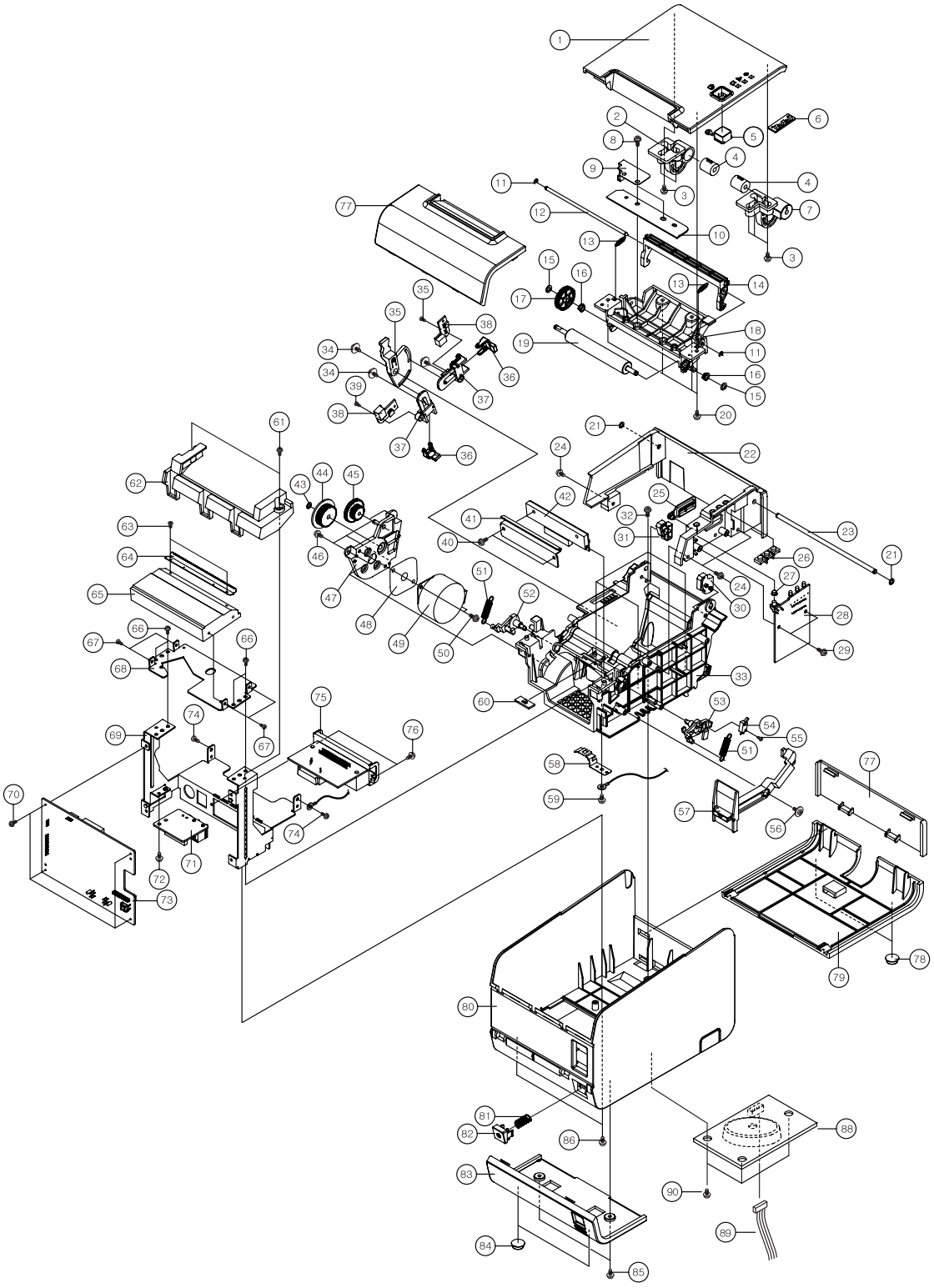


Chapter 8

Exploded Views and Parts List

8.1 Exploded View
8.2 Parts List

8.1 Exploded View



8.2 Parts List

No.	Code No.	Description	Specification	Q`ty	Remark	Serviceable
1	JK72-20151A	PMO-COVER OPEN	HIPS(HB),HI425TV,IVORY	1		Y
	JK72-20151B	PMO-COVER OPEN	HIPS(HB),HI425TV,DARK GRAY	1		Y
2	JK72-20162A	PMO-OPEN ARM LEFT	PC+ABS,HAC8250,IVORY	1		Y
	JK72-20162B	PMO-OPEN ARM LEFT	PC+ABS,HAC8250,DARK GRAY	1		Y
3	JK70-50036A	SCREW-TAPTITE	PWH,+,M3,L10,WHITE	6		Y
	JK70-50044A	SCREW-TAPTITE	PWH,+,M3,L10,BLACK	6		Y
4	JK75-20013A	OPEN DAMPER	NIFCO,DPG04	2		Y
5	JK72-20159A	PMO-FEEDING BUTTON	HIPS(HB),HI425TV,IVORY	1		Y
	JK72-20159B	PMO-FEEDING BUTTON	HIPS(HB),HI425TV,DARK GRAY	1		Y
6	JK72-20160A	PMO-COVER LED OPEN	PMMA	1		Y
7	JK72-20163A	PMO-OPEN ARM RIGHT	PC+ABS,HAC8250,IVORY	1		Y
	JK72-20163B	PMO-OPEN ARM RIGHT	PC+ABS,HAC8250,DARK GRAY	1		Y
8	6001-000665	SCREW-MACHINE	PWH,+,M3,L4,ZPC(YEL),SM20C	2		Y
9	JK70-20049A	IPR-BRKT CUTTER GND	SUS304,T0.15	1		Y
10	JK70-20047A	IPR-FIXED CUTTER	-	1		Y
11	JK70-50010A	E-RING	ø2	2		Y
12	JK70-70015A	ICT-SHAFT HOLDER LOCK	SUM24L,Ni	1		Y
13	JK70-30001A	SPRING-HOOK	SWP-B,Φ0.6	2		Y
14	JK72-20156A	PMO-HOLDER LOCK	PC+ABS,HAC8250,IVORY	1		Y
	JK72-20156B	PMO-HOLDER LOCK	PC+ABS,HAC8250,DARK GRAY	1		Y
15	JK70-50040A	POLY WASHER	IDØ3.1,ODØ6.0,T0.5(RED)	2		Y
16	JK70-50019A	ICT-BUSHING_PI4	SBF-2218,OIL,PI4	2		Y
17	JK72-20171A	PMO-GEAR ROLLER	DURACON M90,BLK	1		Y
18	JK72-20155A	PMO-COVER HOLDER	PC+ABS,HAC8250,IVORY	1		Y
	JK72-20155B	PMO-COVER HOLDER	PC+ABS,HAC8250,DARK GRAY	1		Y
19	JK75-20012A	ASSY ROLLER PLATEN	-	1		Y
20	JK70-50036A	SCREW-TAPTITE	PWH,+,M3,L10,WHITE	4		Y
	JK70-50044A	SCREW-TAPTITE	PWH,+,M3,L10,BLACK	4		Y
21	JK70-50040A	POLY WASHER	IDØ3.1,ODØ6.0,T0.5(RED)	2		Y
22	JK72-20153A	PMO-COVER UPPER	HIPS(HB),HI425TV,IVORY	1		Y
	JK72-20153B	PMO-COVER UPPER	HIPS(HB),HI425TV,DARK GRAY	1		Y

8.2 Parts List - continue

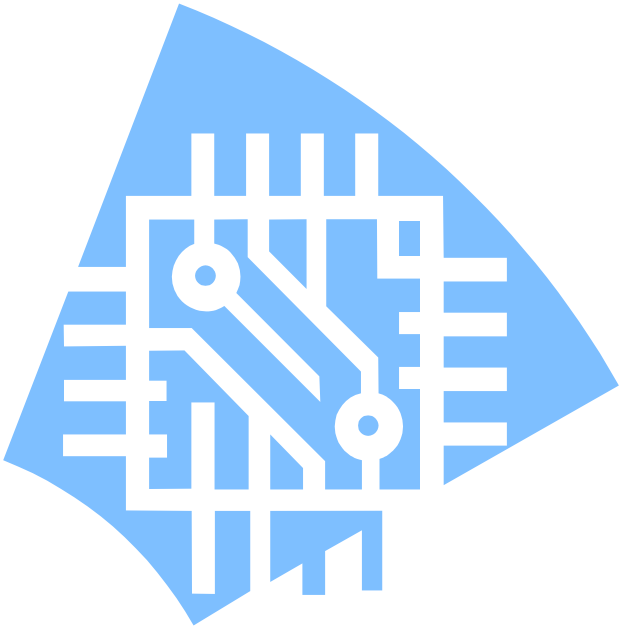
No.	Code No.	Description	Specification	Q`ty	Remark	Serviceable
23	JK70-70014A	ICT-SHAFT HINGE	SUM24L,Ni Cauti	1		Y
24	6002-000174	SCREW-TAPPING	PWH,+,2,M3,L10,ZPC(YEL),SM	3		Y
25	JK70-60012A	RMO-COVER DIP SW	SILICON,GRAY	1		Y
26	JK72-20161A	PMO-COVER LED UPPER;	PMMA	1		Y
27	JK70-60014A	RMO-CAP FEED	SILICON,GREEN	1		Y
28	JK92-01341A	PBA SUB-LED	-	1		Y
29	6002-000174	SCREW-TAPPING	PWH,+,2,M3,L10,ZPC(YEL),SM	2		Y
30	JK72-20169A	PMO-GUIDE PAPER_R	PC+ABS,HAC8250, DARK GRAY	1		Y
31	JK72-20168A	PMO-GUIDE PAPER_L	PC+ABS,HAC8250,DARK GRAY	1		Y
32	6003-000198	SCREW-TAPPING	PWH,+,2,M3,L12,ZPC(YEL),SM	4		Y
33	JK72-20147A	PMO-PAPER SUPPLY	PC+ABS,HAC8250, DARK GRAY	1		Y
34	JK70-50029A	SCREW-TAPPING	PWH,+,M3,L6,WØ10	3		Y
35	JK72-20165A	PMO-KNOB NEAR END	POM,BLACK	1		Y
36	JK72-20166A	PMO-LEVER NEAR END	POM,BLACK	2		Y
37	JK72-20167A	PMO-HOUSING NEAR END,	POM,BLACK	2		Y
38	JK92-01344A	PBA SUB-NEAR P_END	-	2		Y
39	6002-000316	SCREW-TAPPING	PH,+,2,M3,L6,ZPC(YEL),SM20	2		Y
40	6001-000665	SCREW-MACHINE	PWH,+,M3,L4,ZPC(YEL),SM20C	2		Y
41	JK70-20044A	IPR-BRKT HEAD	SECC,T1.0	1		Y
42	JK47-10003A	3" THERMAL PRINT HEAD	-	1		Y
43	JK70-50040A	POLY WASHER	IDØ3.1,ODØ6.0,T0.5(RED)	2		Y
44	JK72-20172A	PMO-GEAR IDLE_52	DURACON M90,BLK	1		Y
45	JK72-20173A	PMO-GEAR REDUCTION27_57	DURACON	1		Y
46	6002-000174	SCREW-TAPPING	PWH,+,2,M3,L10,ZPC(YEL),SM	3		Y
47	JK97-20048A	ASSY HOUSING MOTOR	-	1		Y
48	JK70-60017A	RMO-DAMPER MOTOR	IIR65Hs,T0.6	1		Y
49	JK59-40005A	UNIT STEP MOTOR	-	1		Y
50	6001-000666	SCREW-MACHINE	PWH,+,M3,L6,ZPC(YEL),SM20C	2		Y
51	JK70-30009A	SPRING TPH	SWP-B,ID4.4,OD5.6	2		Y
52	JK70-20036A	IPR-LEVER LEFT	ZNDC-2	1		Y
53	JK70-20037A	IPR-LEVER RIGHT	ZNDC-2	1		Y

8.2 Parts List - continue

No.	Code No.	Description	Specification	Q`ty	Remark	Serviceable
54	3405-001014	SWITCH-MICRO	MPU10550MLB0,MIC	1		Y
55	JK70-50041A	SCREW-MACHINE	RH,+,2,M1.7,L6,WHITE	1		Y
56	JK70-50029A	SCREW-TAPPING	PWH,+,M3,L6,WØ10	1		Y
57	JK72-20157A	PMO-OPEN BUTTON	PC+ABS,HAC8250,98037	1		Y
58	JK70-20045A	IPR-BRKT SHIELD	SUS 304,T0.15	1		Y
59	6002-000175	SCREW-TAPPING	PWH,+,2,M3,L8,ZPC(YEL)	1		Y
60	JK92-01343A	PBA SUB-P_END	-	1		Y
61	6003-000266	SCREW-TAPTITE	PWH,+,S,M3,L6,ZPC(YEL),SWR	2		Y
62	JK72-20164A	PMO-COVER DUMMY	HIPS(HB),HI425TV	1		Y
63	JK70-50009A	SCREW-MACHINE	RH,+,M2,L4,ZPC(WHITE)	2		Y
64	JK70-20041A	IPR-MANUAL CUTTER	SUS 304,T0.5	1		Y
65	JK75-20014A	MEC-UNIT CUTTER	-	1		Y
66	6002-000174	SCREW-TAPPING	PWH,+,2,M3,L10,ZPC(YEL),SM	4		Y
67	6001-000485	SCREW-MACHINE	PH,+,M2.6,L4,ZPC(YEL),SM20	4		Y
68	JK70-20040A	IPR-HOLDER CUTTER	SECC,T1.2	1		Y
69	JK70-20042A	IPR BRKT MAIN	SECC,T1.2	1		Y
70	6003-000266	SCREW-TAPTITE	PWH,+,S,M3,L6,ZPC(YEL),SWR	4		Y
71	JK92-01342A	PBA SUB-POWER	-	1		Y
72	6003-000266	SCREW-TAPTITE	PWH,+,S,M3,L6,ZPC(YEL),SWR	1		Y
73	JK92-01340A	PBA MAIN-BOARD	-	1		Y
74	6002-000174	SCREW-TAPPING	PWH,+,2,M3,L10,ZPC(YEL),SM	2		Y
75	JK94-01168A	ASSY PARALLEL	-	1		Y
	JK94-01169A	ASSY SERIAL	-	1		Y
	JK94-01171A	ASSY RS485	SECC,T1.0	1		Y
76	6003-000266	SCREW-TAPTITE	PWH,+,S,M3,L6,ZPC(YEL),SWR	2		Y
77	JK72-20152A	PMO-COVER REAR	HIPS(HB),HI425TV,IVORY	1		Y
	JK72-20152B	PMO-COVER REAR	HIPS(HB),HI425TV,DARK GRAY	1		Y
78	JK61-40902A	FOOT-RUBBER	TN-5630T,SSEC,NR,-,BLK,70HB,	2		Y
79	JK72-20154A	PMO-COVER WIRE	HIPS(HB),HI425TV,IVORY	1		Y
	JK72-20154B	PMO-COVER WIRE	HIPS(HB),HI425TV,DARK GRAY	1		Y
80	JK72-20148A	PMO-CASE LOWER	HIPS(HB),HI425TV	1		Y

8.2 Parts List - continue

No.	Code No.	Description	Specification	Q`ty	Remark	Serviceable
81	JK70-30010A	SPRING POWER BUTTON	SWP-B,ID6.0	1		Y
82	JK72-20158A	PMO-POWER BUTTON	HIPS(HB),HI425TV,IVORY	1		Y
	JK72-20158B	PMO-POWER BUTTON	HIPS(HB),HI425TV,DARK GRAY	1		Y
83	JK72-20150A	PMO-COVER FRONT	HIPS(HB),HI425TV,IVORY	1		Y
	JK72-20150B	PMO-COVER FRONT	HIPS(HB),HI425TV,DARK GRAY	1		Y
84	JK61-40902A	FOOT-RUBBER	TN-5630T,SSEC,NR,-,BLK,70HB,	2		Y
85	6002-000175	SCREW-TAPPING	PWH,+,2,M3,L8,ZPC(YEL)	2		Y
	JK70-50044A	SCREW-TAPTITE	PWH,+,M3,L10,BLACK	2		Y
86	JK39-40661A	HARNESS-GND WIRE	ELLIX 20,30mm,GREEN	1		Y
87	JK39-40662A	HARN-GND WIRE	:ELLIX 20,90mm,50mm,GREEN	1		Y
88	JK92-01394A	PBA SUB-BELL	ELLIX20(KOR),BELL	1		Y
89	JK39-40308A	CBF-HARNESS	ELLIX20(KOR),BELL	1		Y
90	6002-000175	SCREW-TAPPING	PWH,+,2,M3,L8,ZPC(YEL)	3		Y



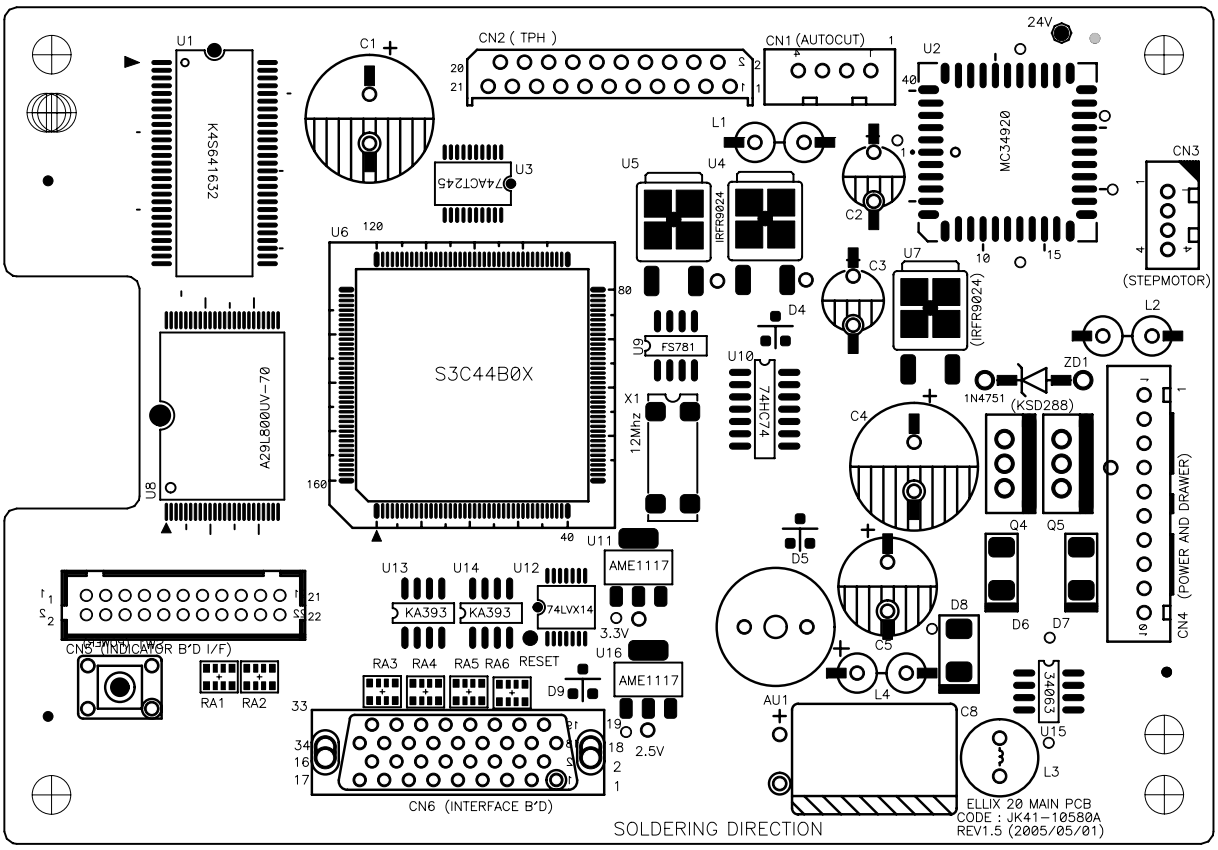
Chapter 9

PCB Layout and Parts List

9.1 Main PCB
9.2 LED PCB
9.3 P-End PCB
9.4 P-Near End PCB
9.5 Power PCB
9.6 RS-232C Serial Interface PCB
9.7 RS-485 Serial Interface PCB
9.8 IEEE-1284 Parallel Interface PCB
9.9 USB Interface PCB
9.10 Ethernet PCB

9.1 Main PCB

9.1.1 Layout



9.1.2 Parts List

Code No.	Description / Specification	Q'TY	Remarks	Serviceable
JK92-01340A	**PBA MAIN-BOARD:ELLIX 20,STD**	1	**ASS'Y**	**Y**
0403-000161	DIODE-ZENER:1N4751,30V,5%,1000MW,DO-41,T	1	ZD1	Y
0403-000525	DIODE-ZENER:1N4733A,5.1V,5%,1W,DO-41,TP	1	ZD2	Y
0502-000287	TR-POWER:KSD288,NPN,25W,TO-220,BK,120-2	2	Q4,Q5	Y
2401-000032	C-AL:100uF,20%,50V,GP,TP,8x12,5mm	2	C1,C5	Y
2401-000132	C-AL:1000uF,35V,20%,SHL35VB1000,12.5x20m	1	C4	Y
2401-000962	C-AL:22uF,20%,50V,GP,TP,5x11,5	2	C2,C3	Y
2401-001363	C-AL:470uF,20%,16V,GP,TP,10x12.5,5	1	C8	Y
3002-001027	BUZZER-PIEZO:85dB,1.5V,24mA,2.048KHz,BK	1	AU1	Y
3301-000344	CORE-FERRITE BEAD:AA,-,3.5x0.6x6.5mm,-,-	3	L1,L2,L4	Y
3404-000210	SWITCH-TACT:4P,DIP,ST	1	SW1	Y
3708-001390	CONNECTOR-FPC/FFC/PIC:21P,2.54MM,STRAIGH	1	CN2	Y
3711-003410	CONNECTOR-HEADER:BOX,4P,1R,2mm,STRAIGHT,	1	CN3	Y
3711-000030	CONNECTOR-HEADER:BOX,4P,1R,2.5mm,ST	1	CN1	Y
3711-002002	CONNECTOR-HEADER:-,22P,2R,2mm,STRAIGHT,S	1	CN5	Y
3711-004112	WAFER;BOX-HEADER,1R,10P,2.5mm,STRAIGHT	1	CN4	Y
3712-000070	CONNECTOR-STACKING:34P,0.8mm,DIP,ST,FEMA	1	CN6	Y
JK27-60101A	COIL-CHOCK:ELLIX 20,IND-101K-RA08MD,4mm	1	L3	Y
JK94-01210A	PHANTOM AU JK92-01340A	1		N
0401-001003	DIODE-SWITCHING:MMBD6050LT1,70V,200mA,22	3	D4,D5,D9	Y
0402-001189	DIODE-RECTIFIER:M4,400V,1A,SMD-2,TP	5	D1,D2,D3,D6,D7	Y
0404-001051	DIODE-SCHOTTKY:SK14,40V,1000MA,DO-214AA,	1	D8	Y
0501-000457	TR-SMALL SIGNAL:MMBT2222A,NPN,350MW,SOT-	11	Q2,Q3,Q6,Q7,Q8,Q10, Q11,Q12,Q15,Q16,Q17	Y
0505-000145	FET-SILICON:IRFR9024,P,-60V,-8.8A,0.28oh	3	U4,U5,U7	Y
0801-000454	IC-CMOS LOGIC:74HC74,D FLIP-FLOP,SOP,14P	1	U10	Y
0801-001100	IC-CMOS;74ACT245,TRANSECIVER,TSOP,20P	1	U3	Y
0801-001110	IC-CMOS;74LV14A,INVERTER,TSOP,14P	1	U12	Y
0903-001156	IC-CPU:S3C44B0X01-EDR0,32BIT,TQFP,160P	1	U6	Y
0904-001270	IC-CONTROLLER:MC34920-2I,PLCC,44P,MOTORO	1	U2	Y
1106-001231	IC-SDRAM,K4S641632H-TC(L)75,4Mx16BIT,54P	1	U1	Y

9.1.2 Parts List - continue

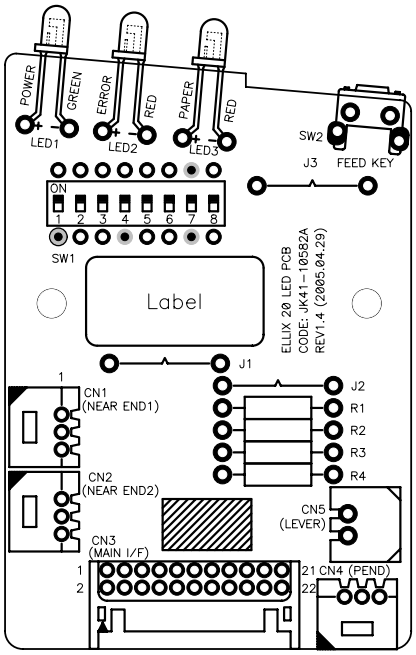
Code No.	Description / Specification	Q'TY	Remarks	Serviceable
1107-001130	IC-FLASH MEMORY;A29L800UV-70,TSOP,48P	1	U8	Y
1202-000164	IC-VOLTAGE COMP.:393,SOP,8P,150MIL,DUAL,	2	U13,U14	Y
1203-000404	IC-DC/DC CONVERTER:34063,SOP,8P,150MIL,P	1	U15	Y
1203-001770	IC-REGULATOR;AME1117(ADJ),SOT-223,4P	2	U11,U16	Y
1205-001771	IC-CLOCK GENERATOR:FS781BZB,SOP,8PIN	1	U9	Y
2007-000029	R-CHIP:0OHM,5%,1/8W,DA,TP,2012	1	L8	Y
2007-000872	R-CHIP:4.7KOHM,5%,1/8W,DA,TP,2012	4	R7,R13,R17,R19	Y
2008-000003	R-CHIP:22OHM,5%,1/10W,1608	2	R78,R89	Y
2008-000008	R-CHIP:100OHM,5%,1/10W,1608	27	R14,R26,R55,R61,R63 R65,R66,R69,R73,R76 R77,R79,R81,R82,R83 R84,R86,R87,R88,R90 R91,R93,R95,R97, R100,R107,R113	Y
2008-000009	R-CHIP:120OHM,5%,1/10W,1608	3	R49,R59,R62	Y
2008-000012	R-CHIP:200OHM,5%,1/10W,1608	4	R33,R34,R52,R85	Y
2008-000026	R-CHIP:1KOHM,5%,1/10W,1608	2	R20,R25	Y
2008-000034	R-CHIP:3.3KOHM,5%,1/10W,1608	1	R47	Y
2008-000037	R-CHIP:4.7KOHM,5%,1/10W,1608	21	R16,R22,R23,R36,R43 R45,R48,R57,R58,R70 R74,R80,R92,R94,R96 R98,R108,R109,R110, R111,R112	Y
2008-000044	R-CHIP:10KOHM,5%,1/10W,1608	23	R8,R9,R21,R24,R28, R29,R30,R38,R40,R41 R42,R44,R46,R51,R53 R54,R99,R101,R102, R103,R104,R105,R106	Y
2008-000045	R-CHIP:12KOHM,5%,1/10W,1608	1	R6	Y
2008-000046	R-CHIP:15KOHM,5%,1/10W,1608	1	R68	Y
2008-000048	R-CHIP:20KOHM,5%,1/10W,1608	3	R31,R32,R60	Y

9.1.2 Parts List - continue

Code No.	Description / Specification	Q'TY	Remarks	Serviceable
2008-000054	R-CHIP:36KOHM,5%,1/10W,1608	7	R10,R27,R35,R50,R67 R72,R75	Y
2008-000056	R-CHIP:47KOHM,5%,1/10W,1608	1	R39	Y
2008-000063	R-CHIP:100KOHM,5%,1/10W,1608	1	R64	Y
2008-000065	R-CHIP:150KOHM,5%,1/10W,1608	1	R71	Y
2009-000001	R-CHIP:0.68OHM,1%,1W,6432	4	R4,R5,R12,R15	Y
2011-001093	R-NETWORK:100ohm,5%,1/16W,L,CHIP,8P,TP	6	RA1,RA2,RA3,RA4, RA5,RA6	Y
2201-000119	C-CERAMIC,DISC:100nF,+80-20%,50V,Y5V,TP,	7	C11,C12,C15,C17,C20, C25,C29	Y
2204-000004	C-CERAMIC,CHIP:22pF,5%,50V,1608	5	C33,C39,C60,C62,C64	Y
2204-000010	C-CERAMIC,CHIP:100pF,5%,50V,1608	8	C9,C10,C18,C31,C32, C41,C44,C50	Y
2204-000015	C-CERAMIC,CHIP:470pF,5%,50V,1608	2	C16,C35	Y
2204-000016	C-CERAMIC,CHIP:680pF,5%,50V,1608	1	C46	Y
2204-000023	C-CERAMIC,CHIP:10nF,10%,50V,X7R,1608	6	C21,C22,C49,C51,C53 C54	Y
2204-000028	C-CERAMIC,CHIP:100nF,+80-20%,25V,Y5V,160	32	C14,C19,C23,C24,C26 C30,C34,C36,C37,C42 C43,C47,C48,C52,C55 C56,C57,C58,C59,C61 C63,C65,C66,C67,C68 C69,C70,C71,C72,C73 C74,C75	Y
2204-000029	C-CERAMIC,CHIP:1uF,+80-20%,16V,Y5V,1608	6	C13,C27,C28,C38,C40 C45	Y
2205-000002	C-TANTAL:10uF,16V,3528	2	C6,C7	Y
2801-001474	CRYSTAL-SMD:12MHz,50ppm,28-AAV,10pF,60oh	1	X1	Y
3301-000317	CORE-FERRITE BEAD:AB,2x1.25x0.9mm,-,-	14	L5,L6,L7,L9,L10,L11, L12,L13,L14,L15,L16, L17,L18,L19	Y
JK41-10580A	PCB-MAIN:ELLIX 20,FR-4,2L,T1.6mm	1	PCB	N

9.2 LED PCB

9.2.1 Layout

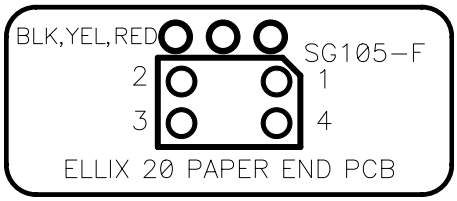


9.2.2 Parts List

Code No.	Description / Specification	Q'TY	Remarks	Serviceable
JK92-01341A	**PBA SUB-LED:ELLIX 20,STD**	**1**	**ASS'Y**	**Y**
0601-000270	LED;3PI,P100,DIP,ST,GREEN	1	LED1	Y
0601-000271	LED;3PI,P100,DIP,ST,RED	2	LED2,LED3	Y
3404-000209	SWITCH-TACT:1102VB,dip,4P,right-angle	1	SW2	Y
3407-000182	SWITCH-DIP:KSD08H,2.54mm,dip,straight	1	SW1	Y
3711-000822	CONNECTOR-HEADER:BOX,2P,1R,2.5mm,ANGLE	1	CN5	Y
3711-003408	CONNECTOR-HEADER:BOX,3P,1R,2mm,ANGLE	3	CN1,CN2,CN4	Y
3712-000011	CONNECTOR-BOX;22P,2MM,2R,right-angle,YH	1	CN3	Y
JK39-40658A	HARN-LED:ELLIX20,150mm,22P,UL1061#26	1		Y
JK94-01270A	PHANTOM AU JK92-01341A	1		N
2001-000488	R-CARBON:200OHM,5%,1/4W,AA,TP,2.4X6.4MM	1	R4	Y
2001-000626	R-CARBON:300OHM,5%,1/4W,AA,TP,2.4X6.4MM	3	R1,R2,R3	Y
2202-000632	C-CERAMIC,MLC-AXIAL:100nF,20%,50V,Z5U,TP	1	C1	Y
JC39-40511A	CBF HARNESS:ML-80,JUMPER,AWG22,52mm,SILV	3	J1,J2,J3	Y
JK41-10582A	PCB-LED:ELLIX 20,FR-1,1L,T1.6mm	1		N

9.3 P-End PCB

9.3.1 Layout

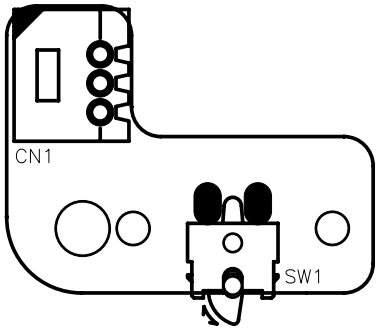


9.3.2 Parts List

Code No.	Description / Specification	Q'TY	Remarks	Serviceable
JK92-01343A	**PBA SUB-P_END:ELLIX 20,STD**	**1**	**ASS'Y**	**Y**
0604-000158	REFLECT-SENSOR:SG-105F,4P,STM-320	1	U1	Y
JK39-40552A	CBF HARNESS-PE SENSOR:STM-210,100MM	1		Y
JK41-10581A	PCB-P/END:ELLIX 20,FR-4,2L,T1.6mm	1	PCB	N

9.4 P-Near End PCB

9.4.1 Layout

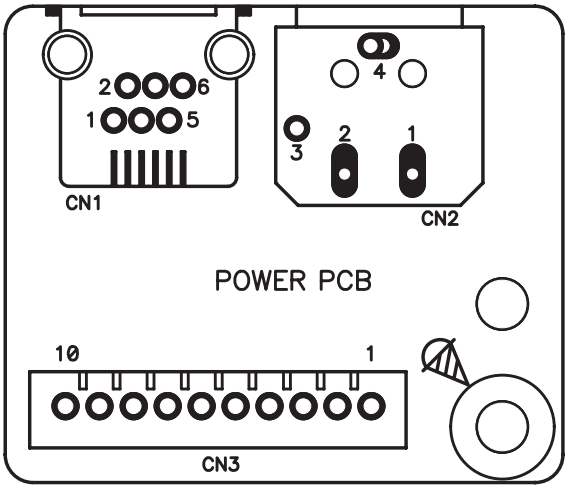


9.4.2 Parts List

Code No.	Description / Specification	Q'TY	Remarks	Serviceable
JK92-01344A	**PBA SUB-NEAR P_END:ELLIX 20,STD**	**1**	**ASS'Y**	Y
3711-003408	CONNECTOR-HEADER:BOX,3P,1R,2mm,ANGLE	1	CN1	Y
JK39-40657A	HARN-NEAR P_END:ELLIX20,200mm,3P,UL1061	1		Y
JK72-20166A	PMO-LEVER NEAR END,ELLIX20,POM,BLACK	1		Y
JK94-01215A	PHANTOM AU JK92-01344A	1		N
3405-001016	SWITCH-MICRO:MPU10992MLB3,PUSHSWICH,SMD	1	SW1	Y
JK41-10577A	PCB-NEAR P/END;STM-210,FR-4,1L,T1.6mm	1	PCB	N

9.5 Power PCB

9.5.1 Layout

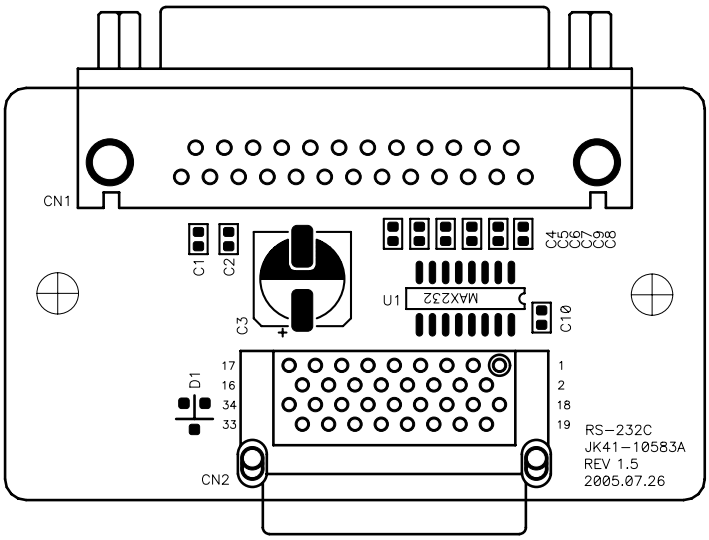


9.5.2 Parts List

Code No.	Description / Specification	Q'TY	Remarks	Serviceable
JK92-01342A	**PBA SUB-POWER:ELLIX 20,STD**	**1**	**ASS'Y**	Y
3601-000261	FUSE-CARTRIDGE:250V,3.15A,TIME-LAG,GLASS	1	FU1	Y
3602-000001	FUSE-CLIP:-,-,30mohm	1	FU1	Y
3722-001034	JACK-MODULAR:6P/6C,-,-,ANGLE,-,-,GRAY,AU	1	CN1	Y
3722-001036	JACK-DC POWER:4P,CJ214N-3	1	CN2	Y
JK39-40621A	HARNESS-POWER 10P:SER-7000,UL1007,#22,80	1	CN3	Y
JK41-10585A	PCB-POWER:ELLIX 20,FR-4,2L,T1.6mm	1	PCB	N

9.6 RS-232C Serial Interface PCB

9.6.1 Layout

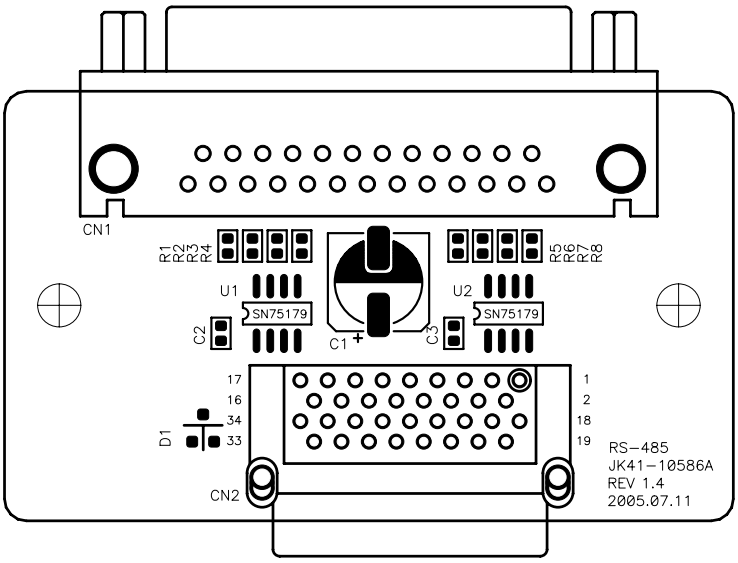


9.6.2 Parts List

Code No.	Description / Specification	Q'TY	Remarks	Serviceable
JK92-01351A	**PBA SUB-I/F:RS-232C,ELLIX 20,STD**	**1**	**ASS'Y**	**Y**
3701-000155	CONNECTOR-DSUB:25P,2R,FEMALE,AN,neltron	1	CN1	Y
3712-000071	CONNECTOR-STACKING:34P,0.8mm,DIP,AN,MALE	1	CN2	Y
JK70-20043B	IPR-BRKT SERIAL;ELLIX20,SECC,T1.0	1		Y
JK94-01230A	PHANTOM AU JK92-01351A	1		N
0401-001003	DIODE-SWITCHING:MMBD6050LT1,70V,200mA,22	1	D1	Y
1006-000133	IC-DRIVER/RECEIVER:232,SOP,16P,150MIL,DU	1	U1	Y
2204-000015	C-CERAMIC,CHIP:470pF,5%,50V,1608	4	C1,C2,C4,C5	Y
2204-000028	C-CERAMIC,CHIP:100nF,+80-20%,25V,Y5V,160	1	C10	Y
2204-000029	C-CERAMIC,CHIP:1uF,+80-20%,16V,Y5V,1608	4	C6,C7,C8,C9	Y
2402-000168	C-AL,SMD:100uF,20%,16V,GP,TP,8.3x8.3x6.3	1	C3	Y
JK41-10583A	PCB-I/F:RS-232,ELLIX 20,FR-4,2L,T1.6mm	1	PCB	N

9.7 RS-485 Serial Interface PCB

9.7.1 Layout

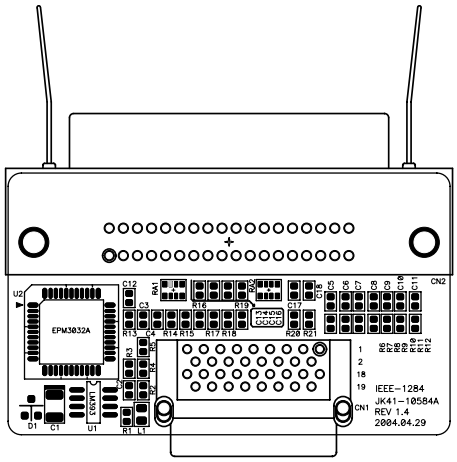


9.7.2 Parts List

Code No.	Description / Specification	Q'TY	Remarks	Serviceable
JK92-01352A	**PBA SUB-I/F:RS-485,ELLIX 20,STD**	**1**	**ASS'Y**	**Y**
3701-000155	CONNECTOR-DSUB:25P,2R,FEMALE,AN,neltron	1	CN1	Y
3712-000071	CONNECTOR-STACKING:34P,0.8mm,DIP,AN,MALE	1	CN2	Y
JK70-20043C	IPR-BRKT RS485 ;ELLIX20,SECC,T1.0	1		Y
JK94-01240A	PHANTOM AU JK92-01352A	1		N
0401-001003	DIODE-SWITCHING:MMBD6050LT1,70V,200mA,22	1	D1	Y
1006-000260	IC-TRANSCEIVER;SN75LB179,SOP8P	2	U1,U2	Y
2008-000008	R-CHIP:100OHM,5%,1/10W,1608	4	R2,R4,R6,R8	Y
2008-000017	R-CHIP:330OHM,5%,1/10W,1608	4	R1,R3,R5,R7	Y
2204-000028	C-CERAMIC,CHIP:100nF,+80-20%,25V,Y5V,160	2	C1,C2	Y
2402-000168	C-AL,SMD:100uF,20%,16V,GP,TP,8.3x8.3x6.3	1	C3	Y
JK41-10586A	PCB-I/F:RS-485,ELLIX 20,FR-4,2L,T1.6mm	1	PCB	N

9.8 IEEE-1284 Parallel Interface PCB

9.8.1 Layout

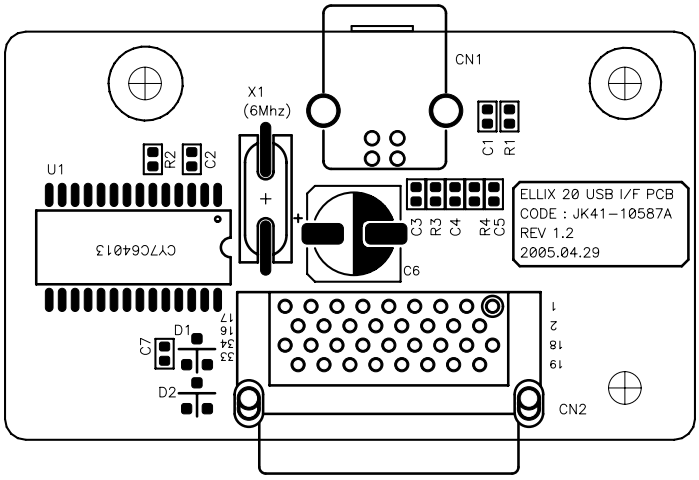


9.8.2 Parts List

Code No.	Description / Specification	Q'TY	Remarks	Serviceable
JK92-01350A	**PBA SUB-I/F:IEEE-1284,ELLIX 20,STD**	1	**ASS'Y**	Y
3701-002001	CONNECTOR-PARALLEL:36P,2R,FEMALE,AN,DIP	1	CN1	Y
3712-000071	CONNECTOR-STACKING:34P,0.8mm,DIP,AN,MALE	1	CN2	Y
JK70-20043A	IPR-BRKT PARALLEL;ELLIX20,SECC,T1.0	1		Y
JK94-01220A	PHANTOM AU JK92-01350A	1		N
0401-001003	DIODE-SWITCHING:MMBD6050LT1,70V,200mA,22	1	D1	Y
1103-000001	IC-CPLD;EPM3032ATC44-10,TQFP,44P	1	U2	Y
1202-000164	IC-VOLTAGE COMP.:393,SOP,8P,150MIL,DUAL,	1	U1	Y
2008-000008	R-CHIP:100OHM,5%,1/10W,1608	1	R1	Y
2008-000031	R-CHIP:2.2KOHM,5%,1/10W,1608	1	R2	Y
2008-000037	R-CHIP:4.7KOHM,5%,1/10W,1608	19	R3,R4,R5,R6,R7,R8, R9,R10,R11,R12,R13, R14,R15,R16,R17, R18,R19,R20,R21	Y
2011-001093	R-NETWORK:100ohm,5%,1/16W,L,CHIP,8P,TP	2	RA1,RA2	Y
2204-000004	C-CERAMIC,CHIP:22pF,5%,50V,1608	17	C2,C3,C4,C5,C6,C7, C8,C9,C10,C11,C12, C13,C14,C15,C16, C17,C18	Y
JK41-10584A	PCB-I/F:IEEE1284,ELLIX 20,FR-4,2L,T1.6mm	1	PCB	N

9.9 USB Interface PCB

9.9.1 Layout

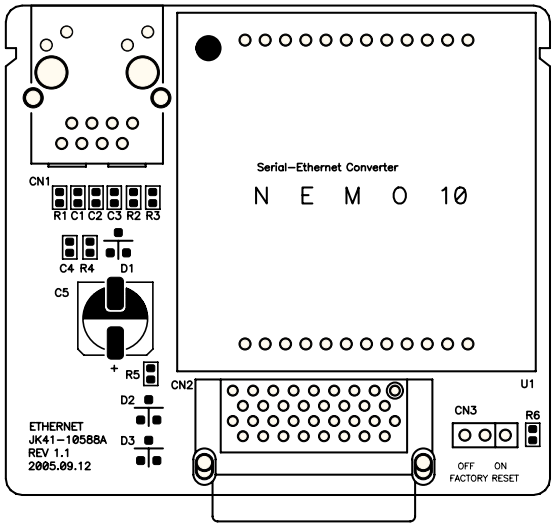


9.9.2 Parts List

Code No.	Description / Specification	Q'TY	Remarks	Serviceable
JK92-01353A	**PBA SUB-I/F:USB,ELLIX 20,STD**	**1**	**ASS'Y**	**Y**
3712-000051	CONNECTOR-USB;BTYPE,4P,1R,AN	1	CN1	Y
3712-000071	CONNECTOR-STACKING:34P,0.8mm,DIP,AN,MALE	1	CN2	Y
JK70-20048A	IPR-BRKT USB;ELLIX20,SECC T1.2	1		Y
6001-000665	SCREW-MACHINE:PWH,+,M3,L4,ZPC(YEL),SM20C	2	BRK'T + I/F B'D	Y
JK94-01250A	PHANTOM AU JK92-01353A	1		N
0401-001003	DIODE-SWITCHING:MMBD6050LT1,70V,200mA,22	2	D1,D2	Y
1006-000261	IC-USB TO SERIAL CONVERTER:CY7C64013	1	U1	Y
2008-000003	R-CHIP:22OHM,5%,1/10W,1608	2	R3,R4	Y
2008-000028	R-CHIP:1.5KOHM,5%,1/10W,1608	1	R2	Y
2008-000071	R-CHIP:470KOHM,5%,1/10W,1608	1	R1	Y
2204-000004	C-CERAMIC,CHIP:22pF,5%,50V,1608	2	C4,C5	Y
2204-000025	C-CERAMIC,CHIP:47nF,+80-20%,50V,Y5V,1608	1	C1	Y
2204-000028	C-CERAMIC,CHIP:100nF,+80-20%,25V,Y5V,160	3	C2,C3,C7	Y
2402-000168	C-AL,SMD:100uF,20%,16V,GP,TP,8.3x8.3x6.3	1	C6	Y
2801-003386	CRYSTAL-SMD:6MHZ,SX-1,16pF	1	X1	Y
JK41-10587A	PCB-IF:USB,ELLIX 20,FR-4,2L,T1.6mm	1	PCB	N

9.10 Ethernet PCB

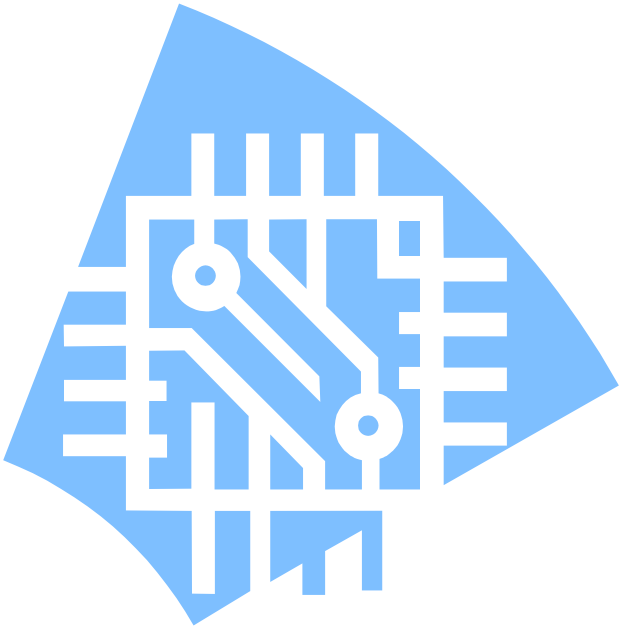
9.10.1 Layout



9.10.2 Parts List

Code No.	Description / Specification	Q'TY	Remarks	Serviceable
JK92-01354A	**PBA SUB-I/F:ETHERNET,ELLIX 20,STD**	**1**	**ASS'Y**	**Y**
3710-000111	CONNECTOR-SHUNT:2P,1R,2.54mm,-,AUF	1	CN3 (OFF)	Y
3711-001475	CONNECTOR-HEADER:NOWALL,3P,1R,2.54mm,STR	1	CN3	Y
3712-000071	CONNECTOR-STACKING:34P,0.8mm,DIP,AN,MALE	1	CN2	Y
3722-001040	JACK-MODULAR:12P,SHELLED,LED GRN/YEL,DIP	1	CN1	Y
JK46-00001A	UNIT-ETHERNET MODULE:ELLIX20,NEMO10,DIP	1	U1	Y
JK94-01260A	PHANTOM AU JK92-01354A	1		N
0401-001003	DIODE-SWITCHING:MMBD6050LT1,70V,200mA,22	3	D1,D2,D3	Y
2008-000008	R-CHIP:100OHM,5%,1/10W,1608	1	R1	Y
2008-000026	R-CHIP:1KOHM,5%,1/10W,1608	2	R2,R3	Y
2008-000037	R-CHIP:4.7KOHM,5%,1/10W,1608	2	R5,R6	Y
2008-000048	R-CHIP:20KOHM,5%,1/10W,1608	1	R4	Y
2204-000016	C-CERAMIC,CHIP:680pF,5%,50V,1608	1	C3	Y
2204-000028	C-CERAMIC,CHIP:100nF,+80-20%,25V,Y5V,160	2	C1,C2	Y
2204-000029	C-CERAMIC,CHIP:1uF,+80-20%,16V,Y5V,1608	1	C4	Y
2402-000168	C-AL,SMD:100uF,20%,16V,GP,TP,8.3x8.3x6.3	1	C5	Y
JK41-10588A	PCB-IF:ETHERNET,ELLIX 20,FR-4,2L,T1.6mm	1	PCB	N

M E M O

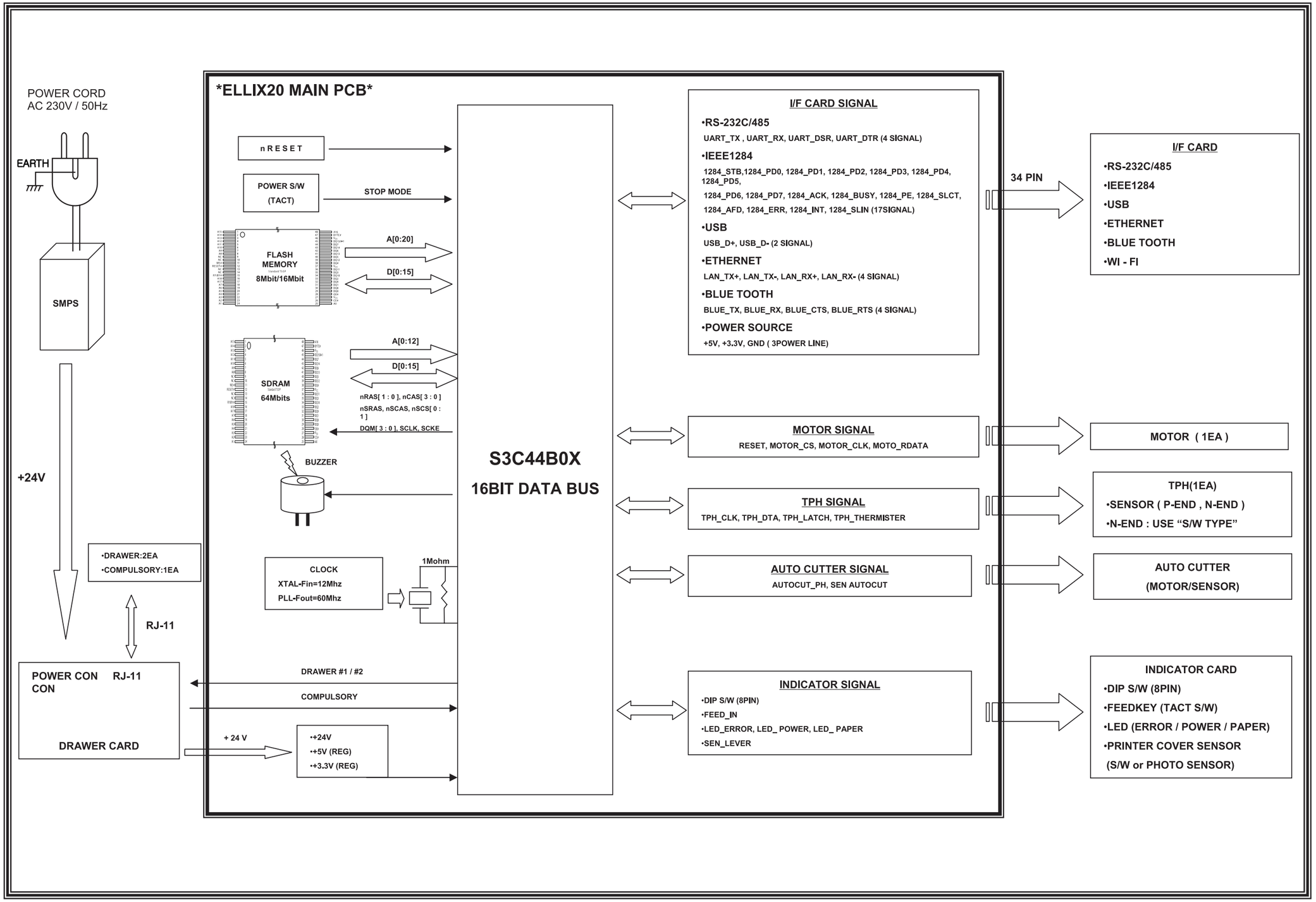


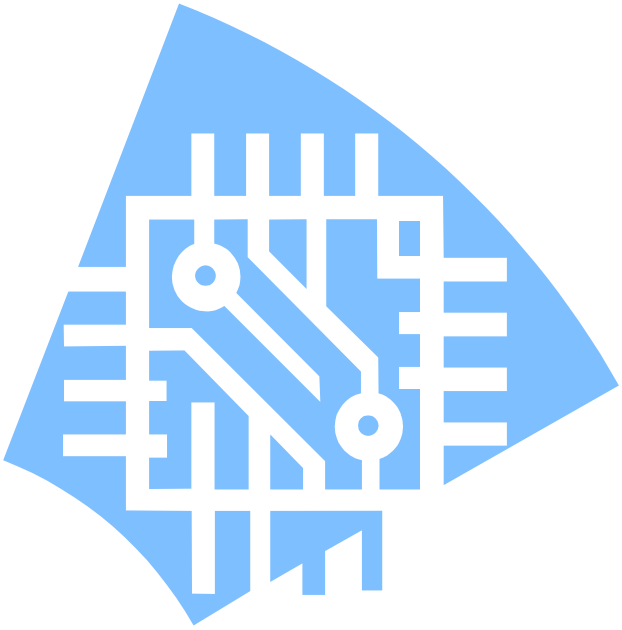
Chapter 10

Block Diagram

10.1 ELLIX 20

10.1 ELLIX 20


POWER CORD
AC 230V / 50Hz
EARTH
SMPS
+24V
ELLIX20 MAIN PCB
n R E S E T
POWER S/W
(TACT)
STOP MODE
FLASH
MEMORY
8Mbit/16Mbit
A[0:20]
D[0:15]
SDRAM
64Mbits
A[0:12]
D[0:15]
nRAS[1 : 0], nCAS[3 : 0]
nSRAS, nSCAS, nSCS[0 : 1]
DQM[3 : 0], SCLK, SCKE
BUZZER
CLOCK
XTAL-Fin=12Mhz
PLL-Fout=60Mhz
1Mohm
S3C44B0X
16BIT DATA BUS
I/F CARD SIGNAL
•RS-232C/485
UART_TX , UART_RX, UART_DSR, UART_DTR (4 SIGNAL)
•IEEE1284
1284_STB,1284_PD0, 1284_PD1, 1284_PD2, 1284_PD3, 1284_PD4, 1284_PD5,
1284_PD6, 1284_PD7, 1284_ACK, 1284_BUSY, 1284_PE, 1284_SLCT,
1284_AFD, 1284_ERR, 1284_INT, 1284_SLIN (17SIGNAL)
•USB
USB_D+, USB_D- (2 SIGNAL)
•ETHERNET
LAN_TX+, LAN_TX-, LAN_RX+, LAN_RX- (4 SIGNAL)
•BLUE TOOTH
BLUE_TX, BLUE_RX, BLUE_CTS, BLUE_RTS (4 SIGNAL)
•POWER SOURCE
+5V, +3.3V, GND (3POWER LINE)
34 PIN
I/F CARD
•RS-232C/485
•IEEE1284
•USB
•ETHERNET
•BLUE TOOTH
•WI - FI
MOTOR SIGNAL
RESET, MOTOR_CS, MOTOR_CLK, MOTO_RDATA
MOTOR (1EA)
TPH SIGNAL
TPH_CLK, TPH_DTA, TPH_LATCH, TPH_THERMISTER
TPH(1EA)
•SENSOR (P-END , N-END)
•N-END : USE “S/W TYPE”
AUTO CUTTER SIGNAL
AUTOCUT_PH, SEN AUTOCUT
AUTO CUTTER
(MOTOR/SENSOR)
INDICATOR SIGNAL
•DIP S/W (8PIN)
•FEED_IN
•LED_ERROR, LED_ POWER, LED_ PAPER
•SEN_LEVER
INDICATOR CARD
•DIP S/W (8PIN)
•FEEDKEY (TACT S/W)
•LED (ERROR / POWER / PAPER)
•PRINTER COVER SENSOR
(S/W or PHOTO SENSOR)
•DRAWER:2EA
•COMPULSORY:1EA
RJ-11
POWER CON RJ-11
CON
DRAWER CARD
DRAWER #1 / #2
COMPULSORY
+ 24 V
•+24V
•+5V (REG)
•+3.3V (REG)

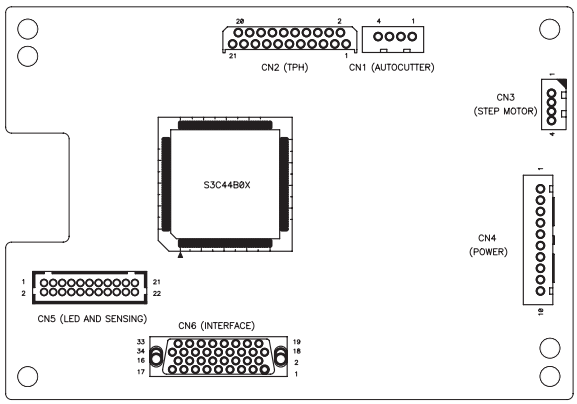


Chapter 11

Wiring Diagram

11.1 Main PCB Block Diagram
11.2 Main PCB Block Wiring Connection
11.3 LED PCB Block Diagram
11.4 LED PCB Block Wiring Connection
11.5 POWER PCB Block Diagram
11.6 POWER PCB Block Wiring Connection

11.1 Main PCB Block Diagram



Connector	Function
CN1	AUTO CUTTER
CN2	TPH
CN3	STEP MOTOR
CN4	POWER
CN5	LED AND SENSING
CN6	INTERFACE

11.2 Main PCB Block Wiring Connection

[CN1: AUTO CUTTER]

Pin No	Signal Name	Pin No	Signal Name	Pin No	Signal Name
1	AUTOCUT-	2	AUTOCUT+	3	AUTOCUT_IN
4	GND	-	-	-	-

[CN2: TPH]

Pin No	Signal Name	Pin No	Signal Name	Pin No	Signal Name
1	+24V(VPH)	2	GND	3	+24V(VPH)
4	GND	5	SO1	6	SI1
7	LATCH	8	VCC	9	/STROBE#1
10	/STROBE#2	11	SCLK	12	SO2
13	SL2	14	TM	15	GND
16	GND	17	+24V	18	GND
19	+24V	20	GND	21	+24V

[CN3: STEP MOTOR]

Pin No	Signal Name	Pin No	Signal Name	Pin No	Signal Name
1	STEPMOT_/B	2	STEPMOT_A	3	STEPMOT_B
4	STEPMOT_/A	-	-	-	-

11.2 Main PCB Block Wiring Connection - countinue

[CN4: POWER]

Pin No	Signal Name	Pin No	Signal Name	Pin No	Signal Name
1	POWER_24V	2	POWER_24V	3	POWER_24V
4	+24V	5	DRAWER#1	6	DRACOMP
7	DRAWER#2	8	GND	9	GND
10	GND	-	-	-	-

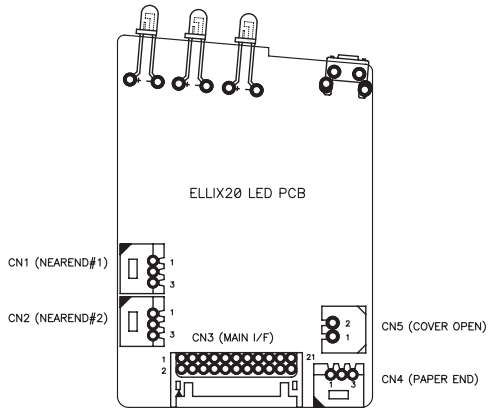
[CN5: LED AND SENSING]

Pin No	Signal Name	Pin No	Signal Name	Pin No	Signal Name
1	DIP-SW1-8	2	DIP-SW1-4	3	DIP-SW1-7
4	DIP-SW1-3	5	DIP-SW1-6	6	DIP-SW1-2
7	DIP-SW1-5	8	DIP-SW1-1	9	PAPEREND_IN
10	PAPER-LED-OUT	11	NEAREND_IN	12	ERROR-LED-OUT
13	N.C	14	PAPEREND_OUT	15	N.C
16	FEED_IN	17	GND	18	GND
19	GND	20	VDD50V	21	GND
22	LEVER_IN	-	-	-	-

[CN6: INTERFACE]

Pin No	Signal Name	Pin No	Signal Name	Pin No	Signal Name
1	GND	2	DATA0	3	DATA1
4	DATA2	5	DATA3	6	DATA4
7	DATA5	8	DATA6	9	DATA7
10	WE	11	OE	12	ADDR0
13	1284 CHIP ENABUE	14	nRESET	15	GND
16	+5V	17	1284 ITERRUPT REQUEST	18	1284 BUSY
19	1284 ACK (UART TXD)	20	1284 SELECT (UART DTR)	21	1284 INIT (UART RXD)
22	1284 AUTO FEED (UART OSR)	23	1284 PAPER ERROR	24	1284 SELECTIN
25	1284_OUT	26	GND	27	+3.3V
28	N.C	29	1284 FAULT	30	DIP C1
31	DIP C2	32	DIP C3	33	DIP R3
34	GND	-	-	-	-

11.3 LED PCB Block Diagram



Connector	Function
CN1	NEAREND#1
CN2	VEAREND#2
CN3	MAIN I/F
CN4	PAPER END
CN5	COVER OPEN

11.4 LED PCB Block Wiring Connection

[CN1: NEAREND#1]

Pin No	Signal Name	Pin No	Signal Name	Pin No	Signal Name
1	N.C	2	GND	3	NEAREND_IN

[CN2: NEAREND#2]

Pin No	Signal Name	Pin No	Signal Name	Pin No	Signal Name
1	N.C	2	GND	3	NEAREND_IN

[CN3: MAIN I/F]

Pin No	Signal Name	Pin No	Signal Name	Pin No	Signal Name
1	DIP_SW1-4	2	DIP_SW1-8	3	DIP_SW1-3
4	DIP_SW1-7	5	DIP_SW1-2	6	DIP_SW1-6
7	DIP_SW1-1	8	DIP_SW1-5	9	POWER_LED
10	PEND_IN	11	ERROR_LED	12	NEAREND_IN
13	PAPER_LED	14	N.C	15	FEED_SW
16	N.C	17	VDD50V	18	GND
19	VDD50V	20	GND	21	LEVER_IN
22	GND	-	-	-	-

[CN4: PAPER END]

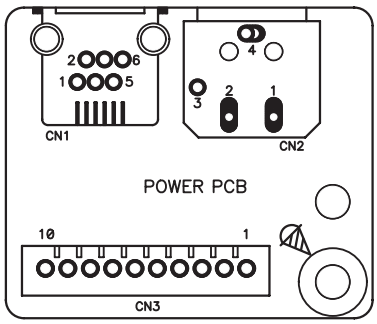
Pin No	Signal Name	Pin No	Signal Name	Pin No	Signal Name
1	GND	2	PEND_IN	3	VDD50V

11.4 LED PCB Block Wiring Connection - continue

[CN5: COVER OPEN]

Pin No	Signal Name	Pin No	Signal Name	Pin No	Signal Name
1	GND	2	LEVER_IN	-	-

11.5 POWER PCB Block Diagram



Connector	Function
CN1	DRAWER
CN2	POWER
CN3	MAIN I/F

11.6 POWER PCB Block Wiring Connection

[CN1: DRAWER]

Pin No	Signal Name	Pin No	Signal Name	Pin No	Signal Name
1	GND	2	DRAWER#1	3	DRACOMP
4	+24V	5	DRAWER#2	6	GND

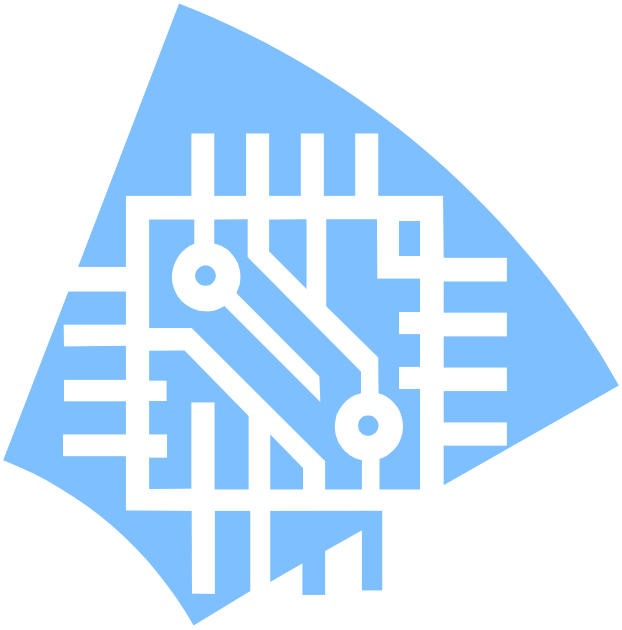
[CN2: POWER]

Pin No	Signal Name	Pin No	Signal Name	Pin No	Signal Name
1	POWER_24V	2	GND	3	N.C
4	GND	-	-	-	-

[CN3: MAIN I/F]

Pin No	Signal Name	Pin No	Signal Name	Pin No	Signal Name
1	GND	2	GND	3	GND
4	DRAWER#2	5	DRACOMP	6	DRAWER#1
7	+24V	8	POWER_24V	9	POWER_24V
10	POWER_24V	-	-	-	-

M E M O

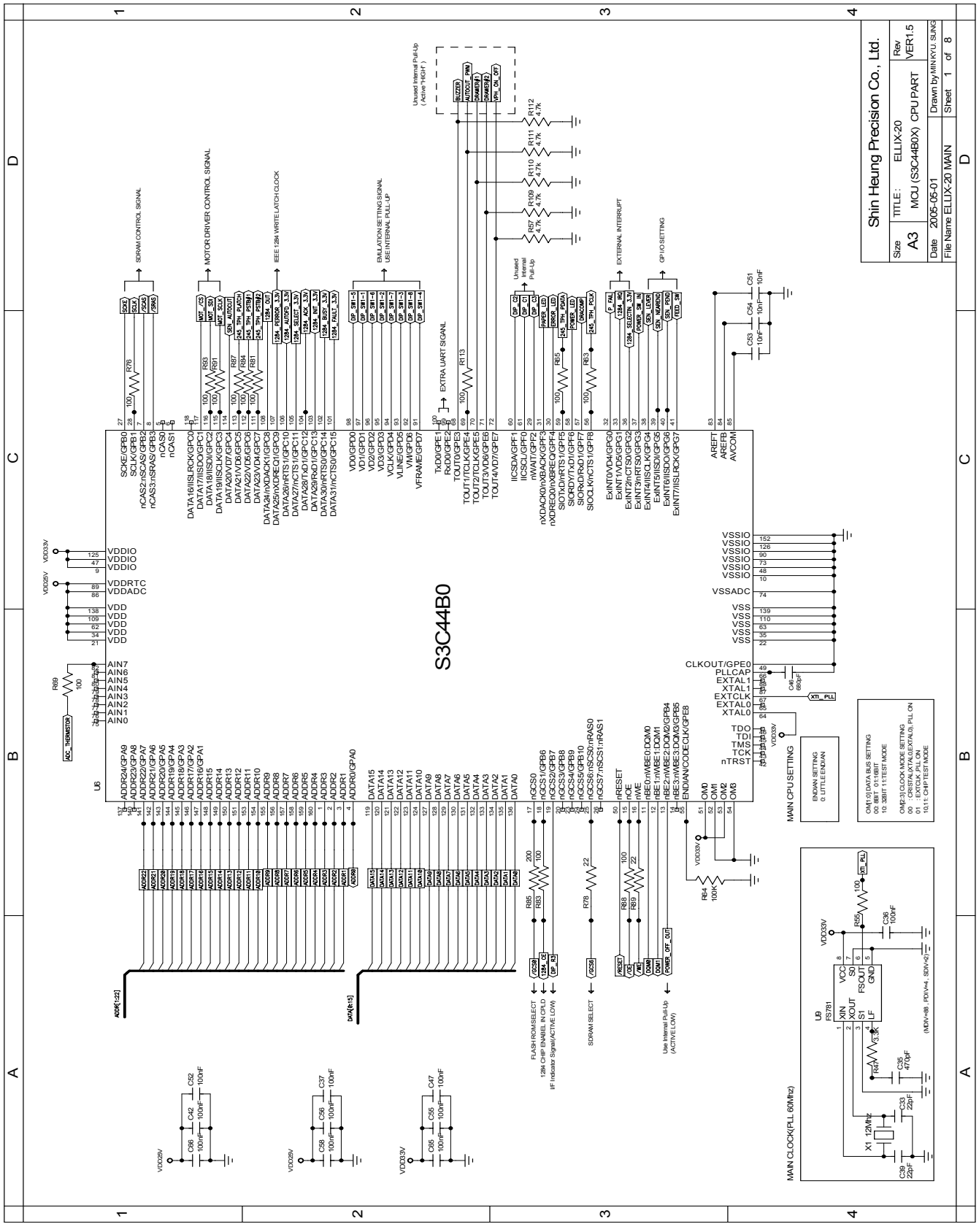


Chapter 12

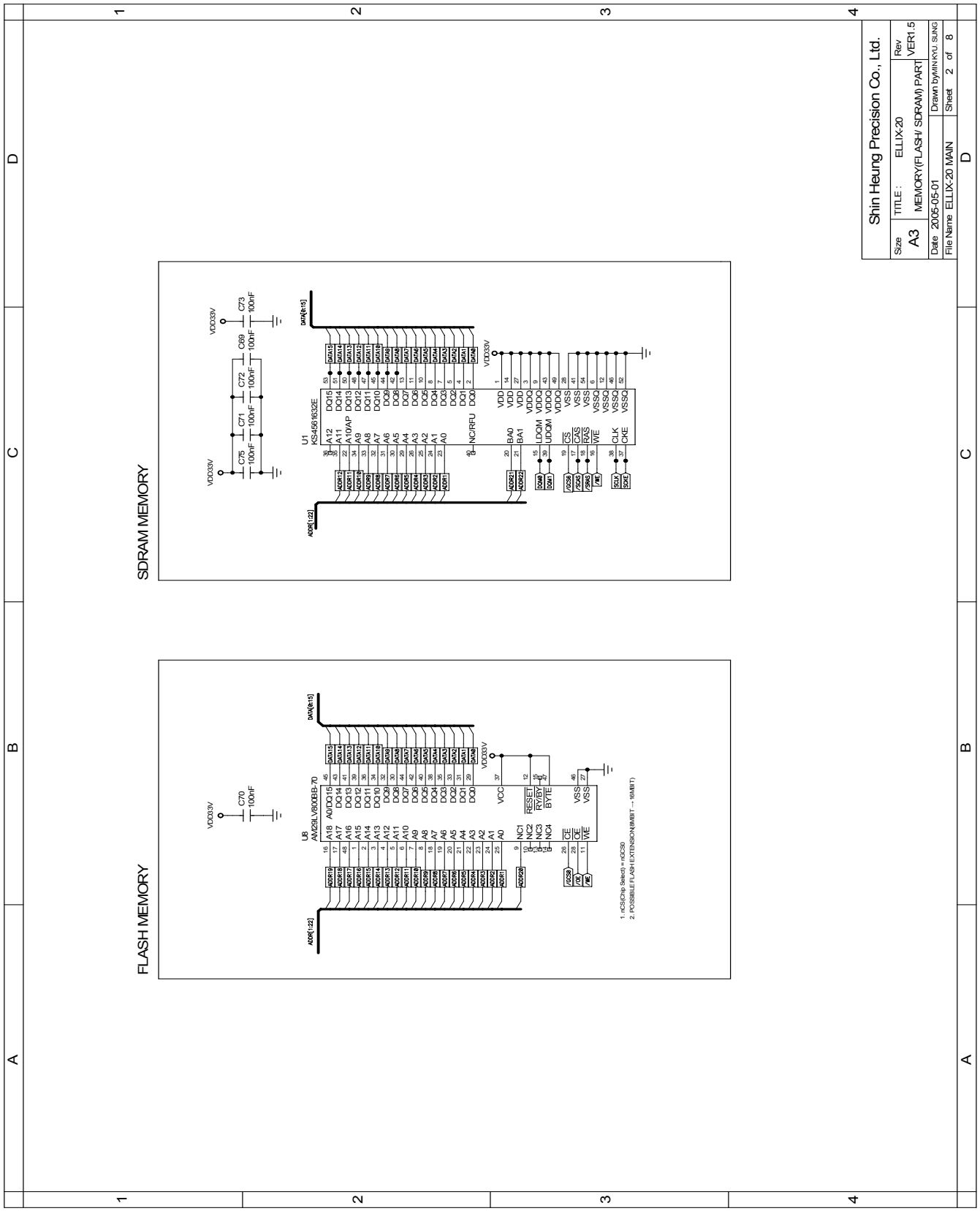
Schematic Diagram

12.1 Main PCB CPU Part
12.2 Main PCB Memory Part
12.3 Main PCB Motor Driver Part
12.4 Main PCB TPH Part
12.5 Main PCB Sensing Part
12.6 Main PCB Drawer / Buzzer / Reset Part
12.7 Main PCB Power Part
12.8 Main PCB Interface Part
12.9 LED PCB Circuit
12.10 Power PCB Circuit
12.11 Paper End PCB Circuit
12.12 RS-232C I/F PCB Circuit
12.13 RS-485 I/F PCB Circuit
12.14 IEEE-1284 Parallel I/F PCB Circuit
12.15 USB I/F PCB Circuit
12.16 Ethernet I/F PCB Circuit

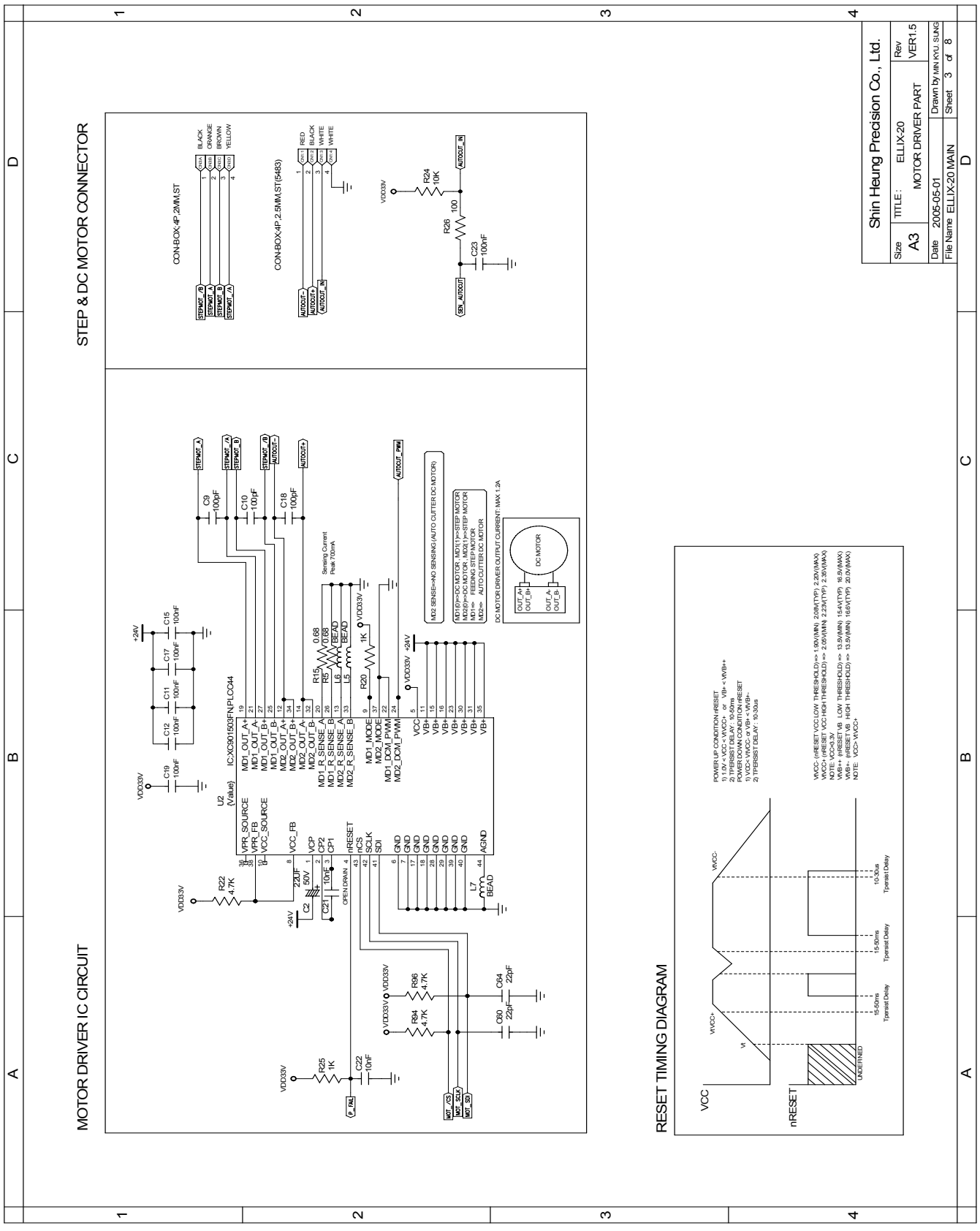
12.1 Main PCB CPU Part



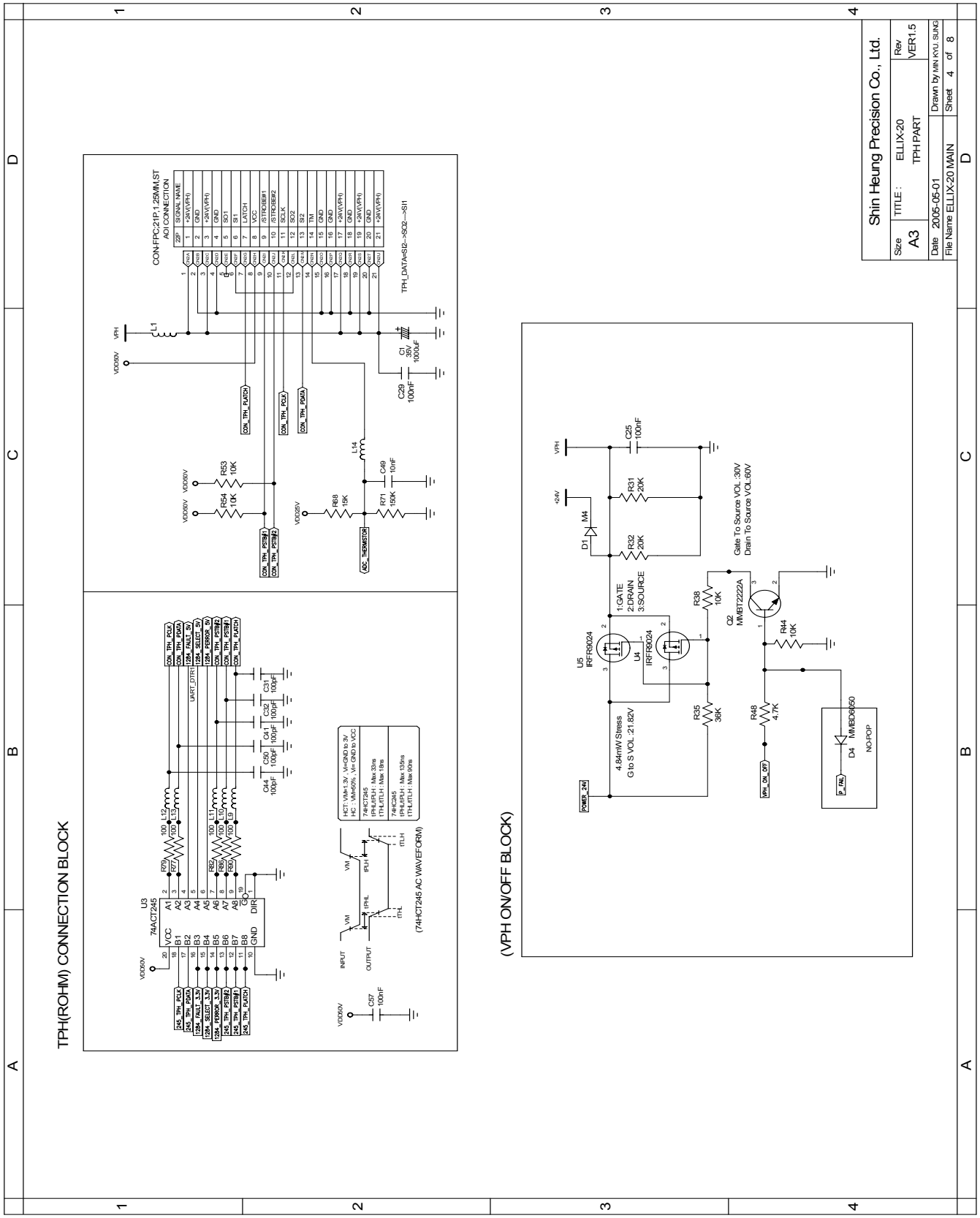
12.2 Main PCB Memory Part



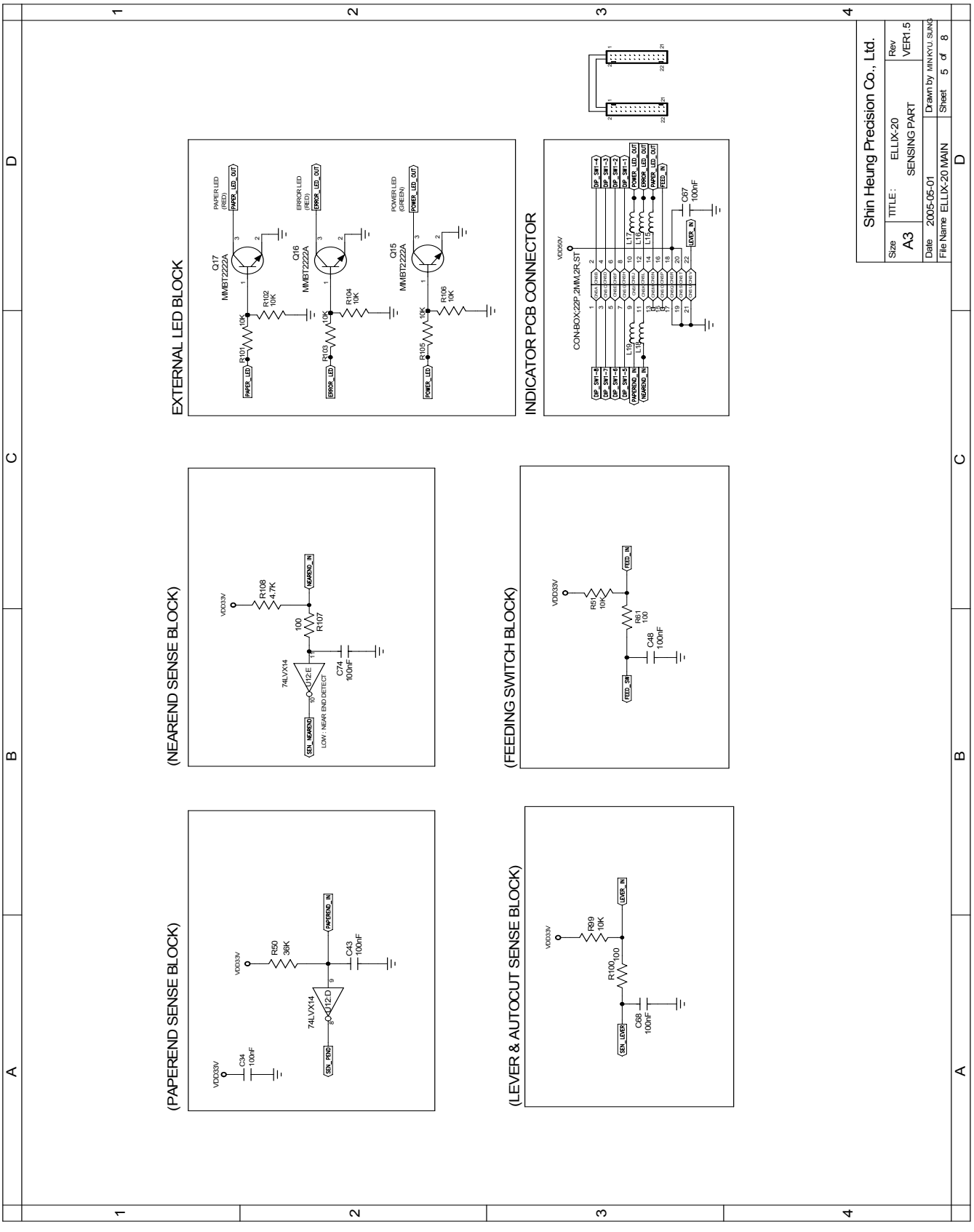
12.3 Main PCB Motor Driver Part



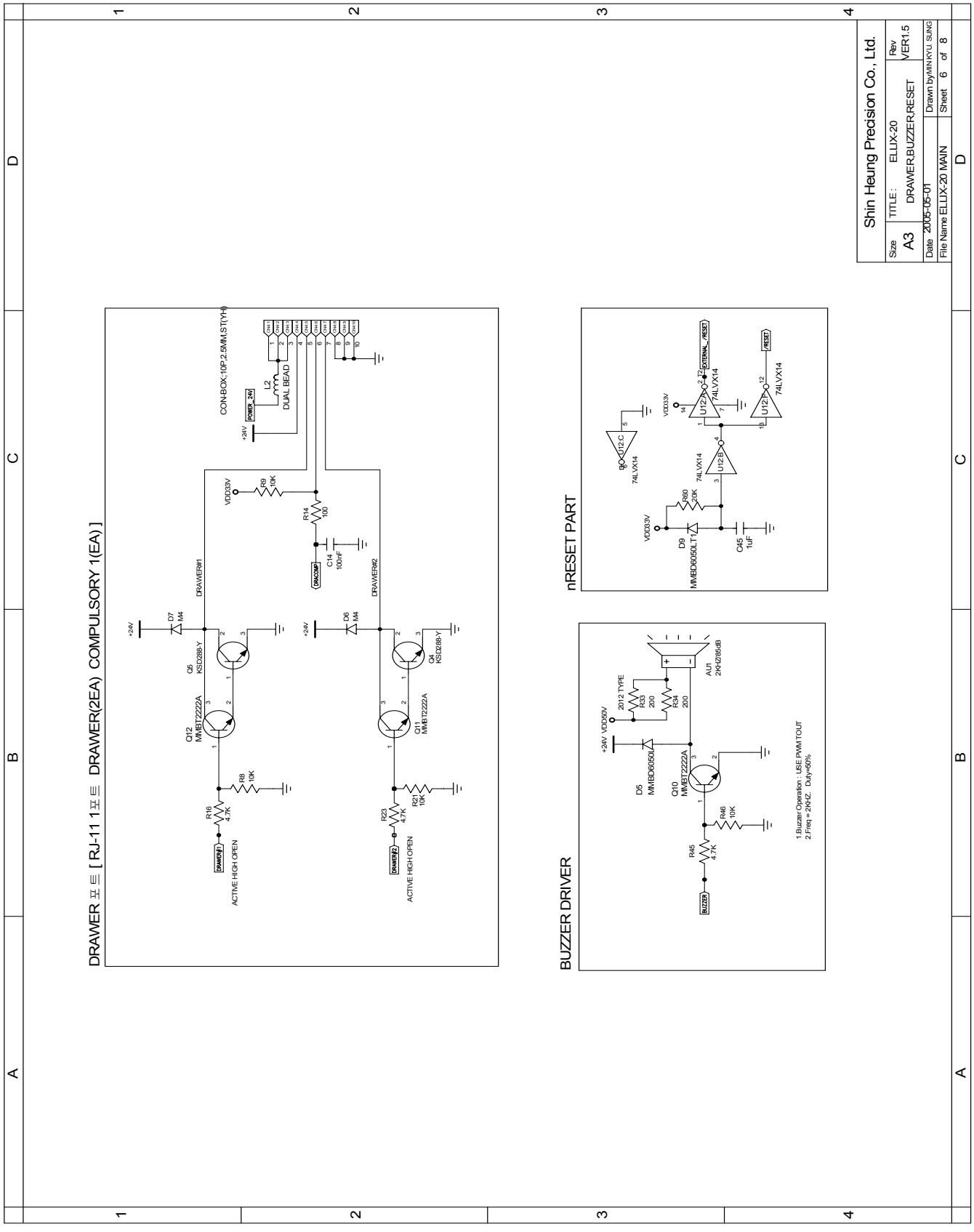
12.4 Main PCB TPH Part



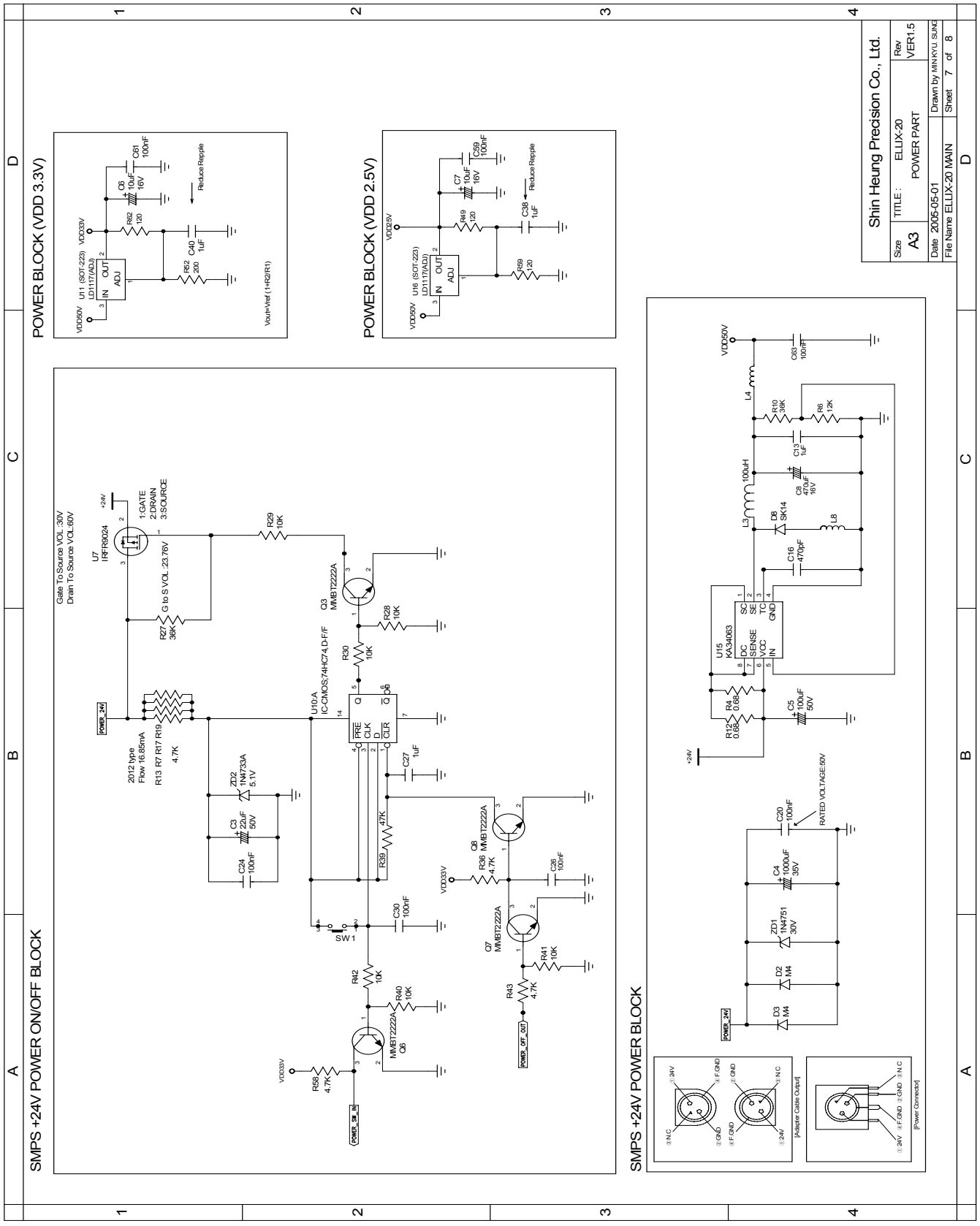
12.5 Main PCB Sensing Part



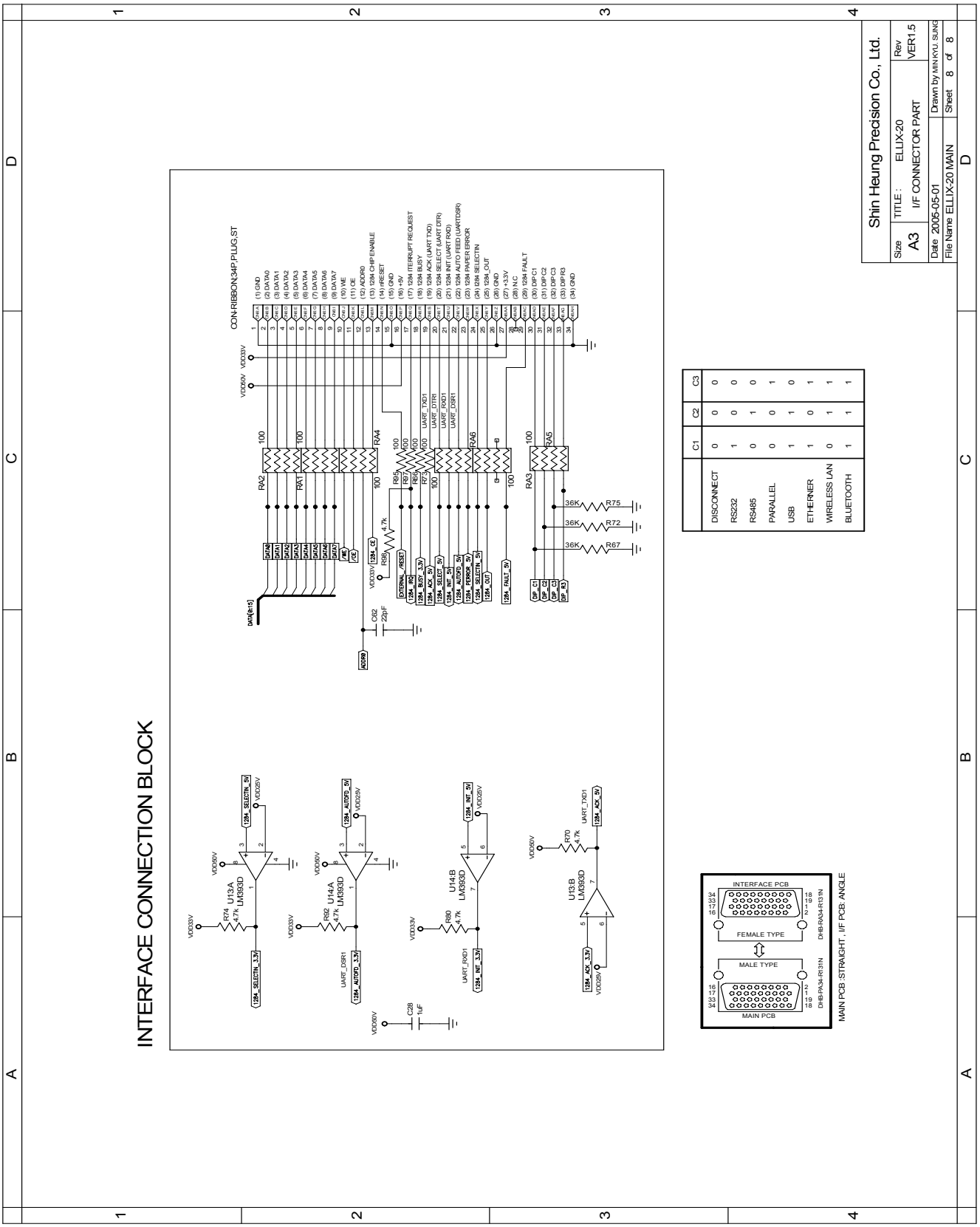
12.6 Main PCB Drawer / Buzzer / Reset Part



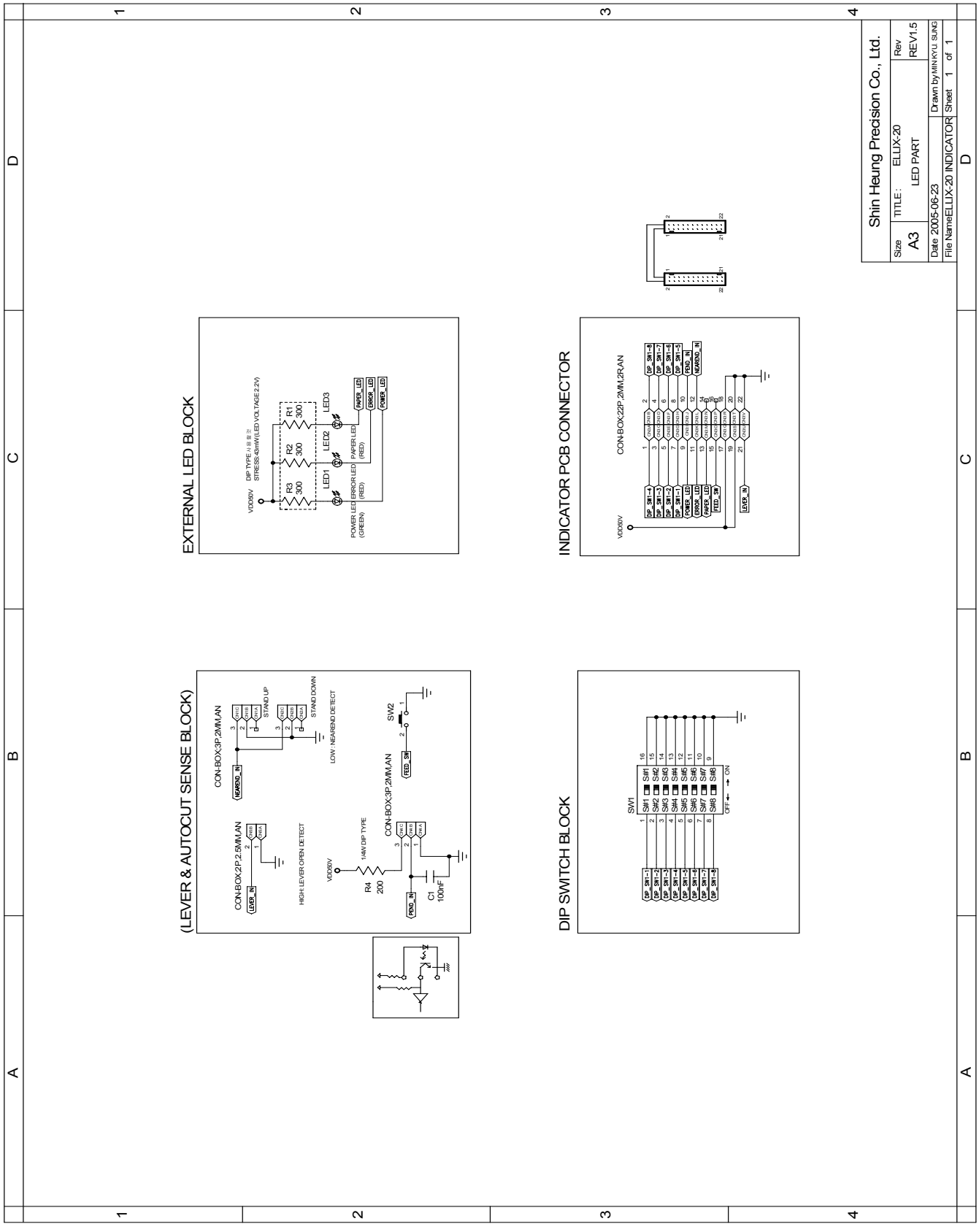
12.7 Main PCB Power Part



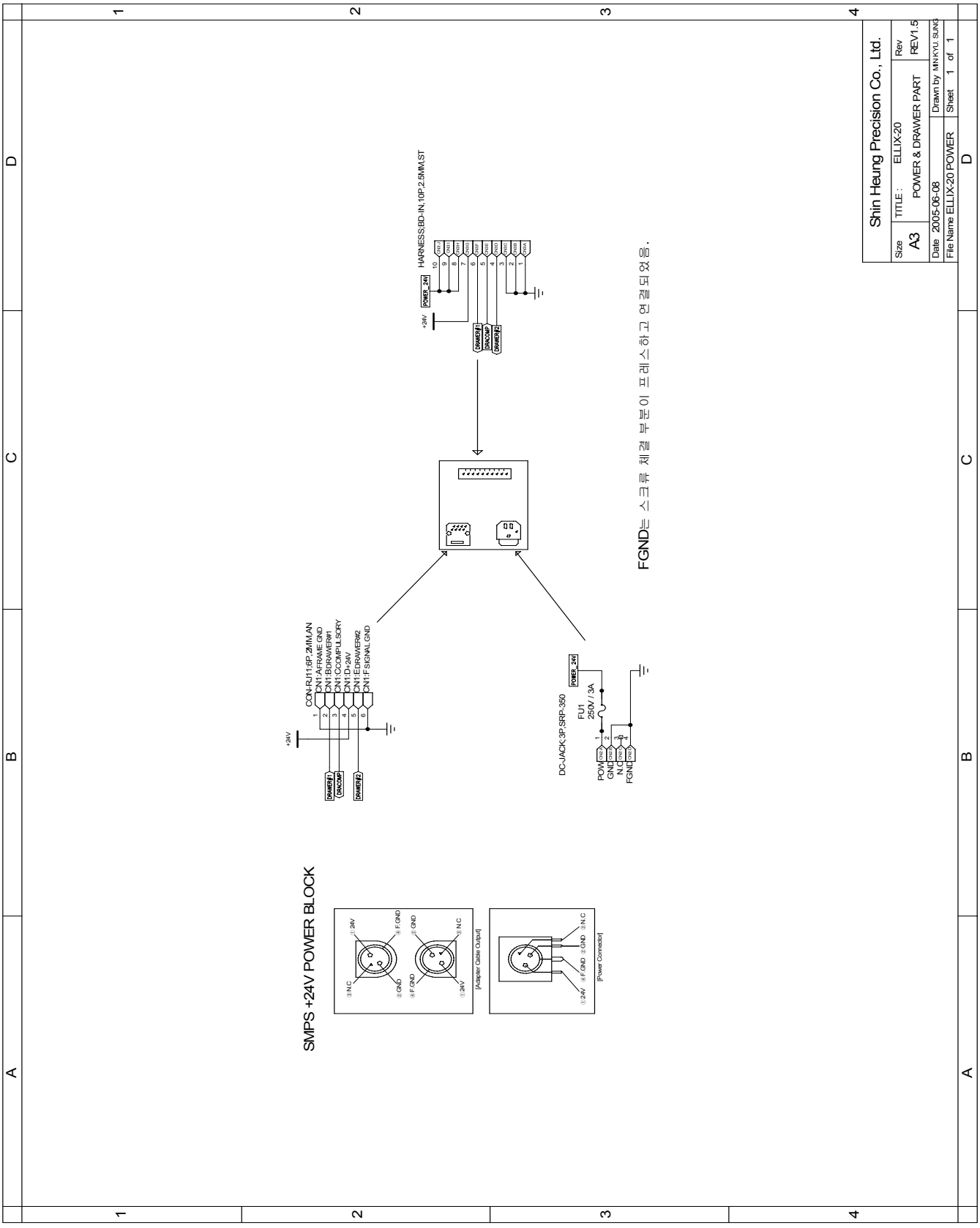
12.8 Main PCB Interface Part



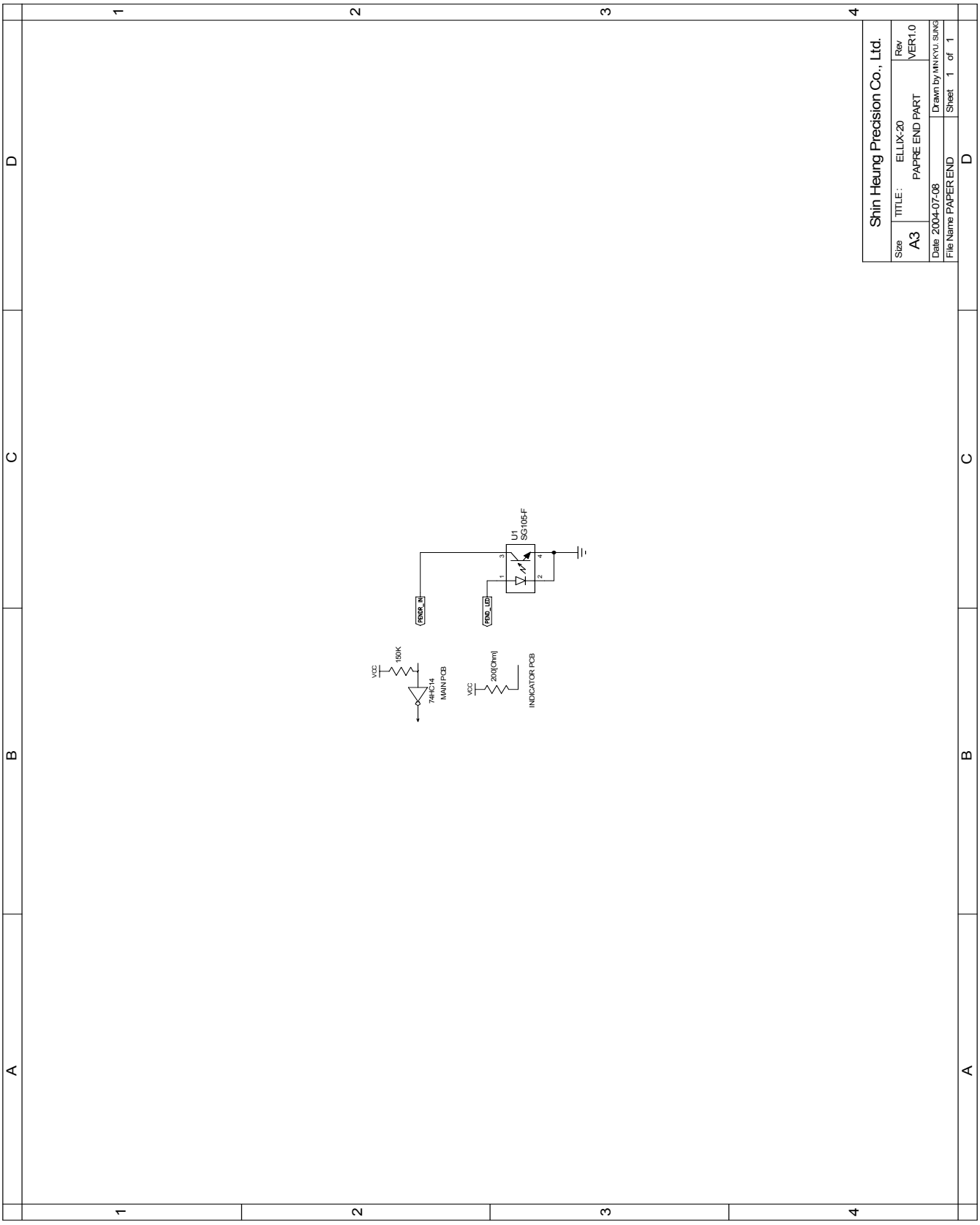
12.9 LED PCB Circuit



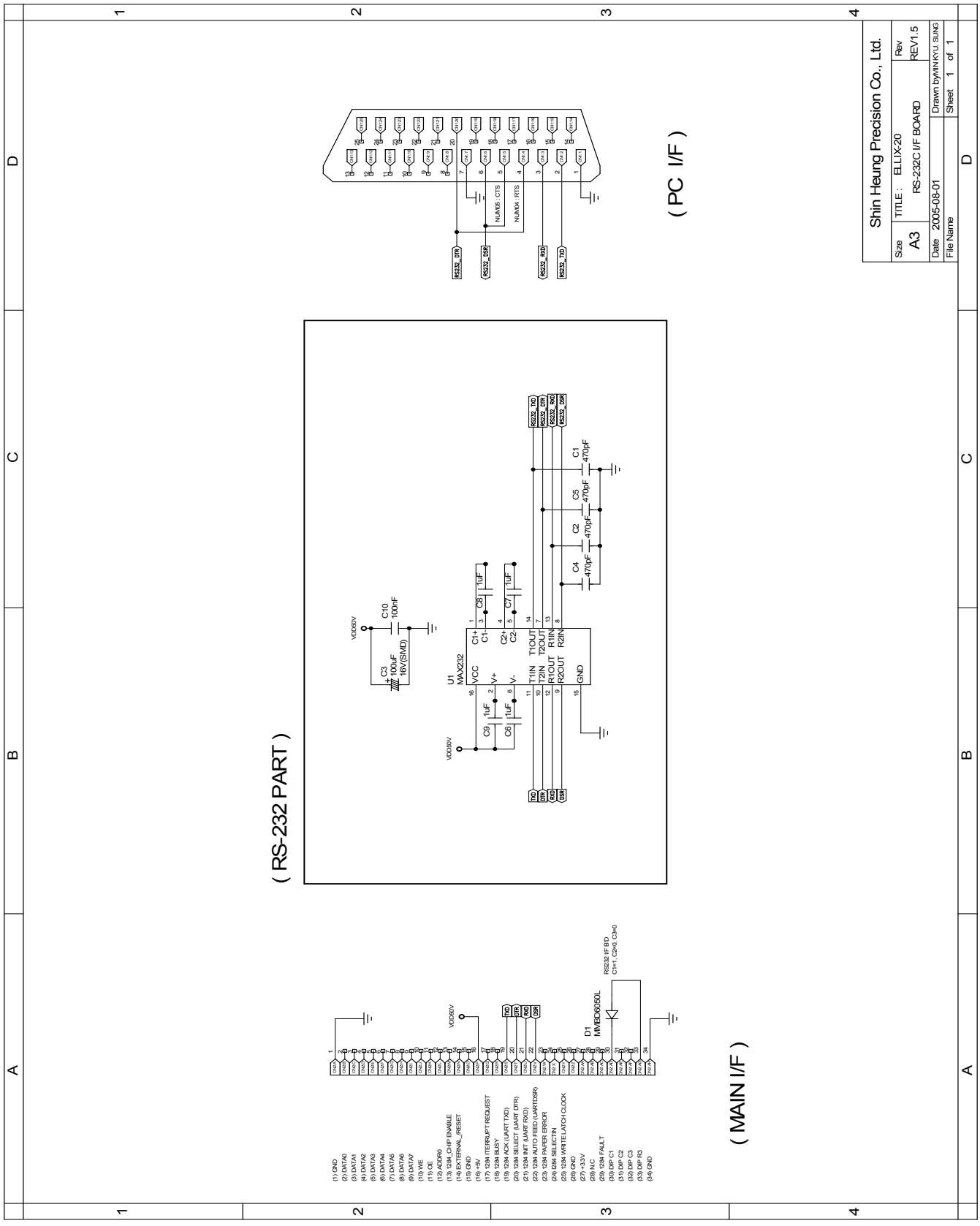
12.10 Power PCB Circuit



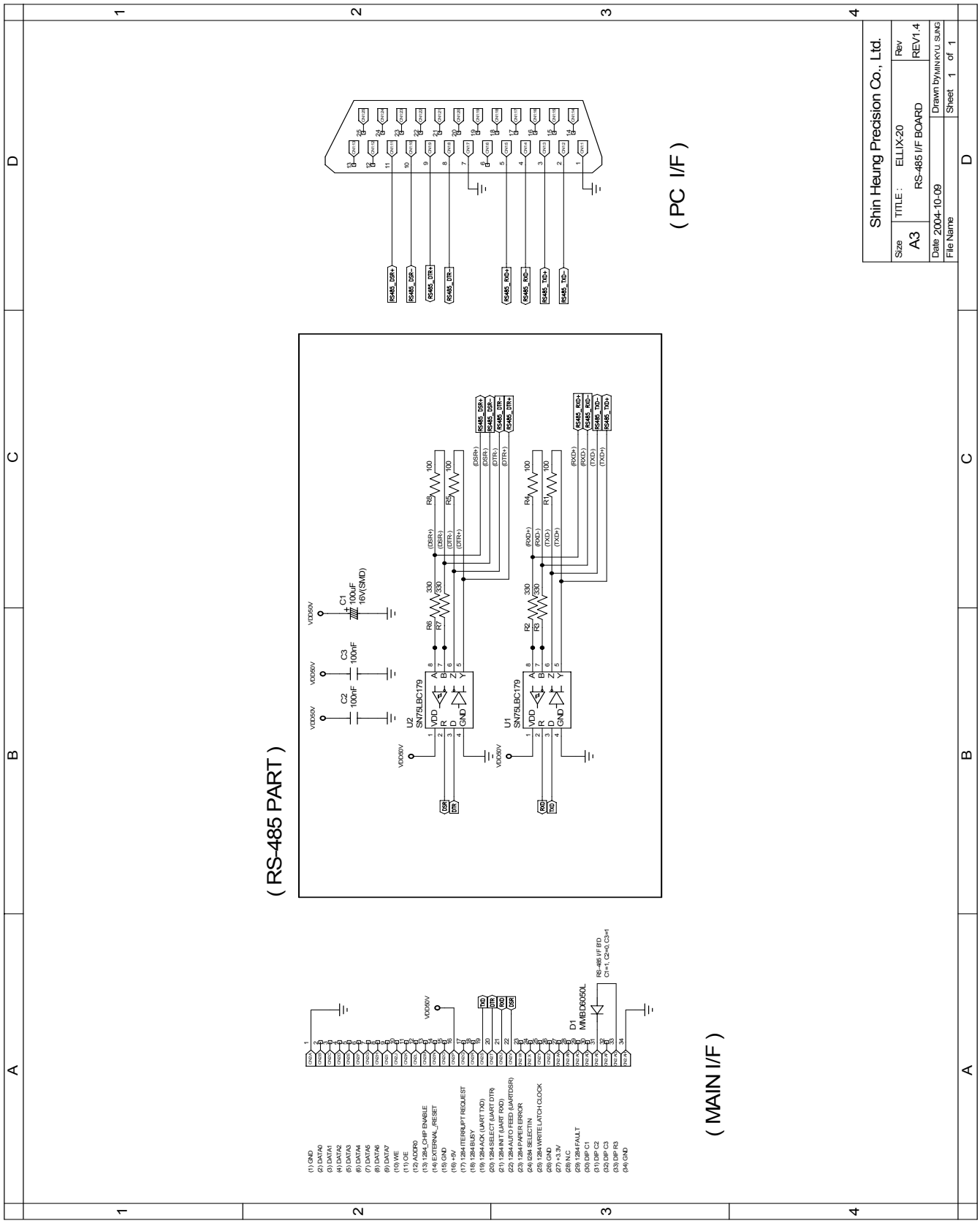
12.11 Paper End PCB Circuit



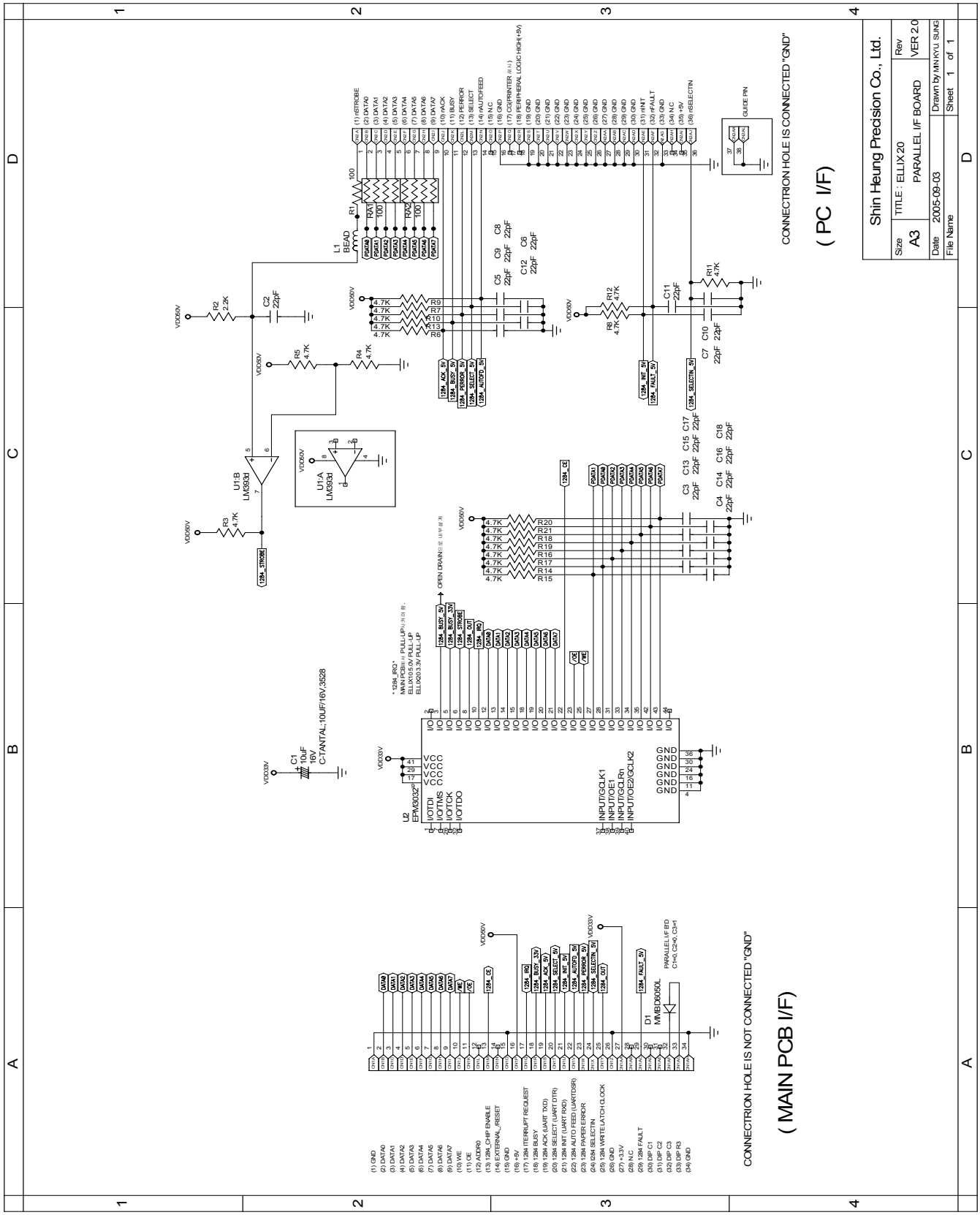
12.12 RS-232C I/F PCB Circuit



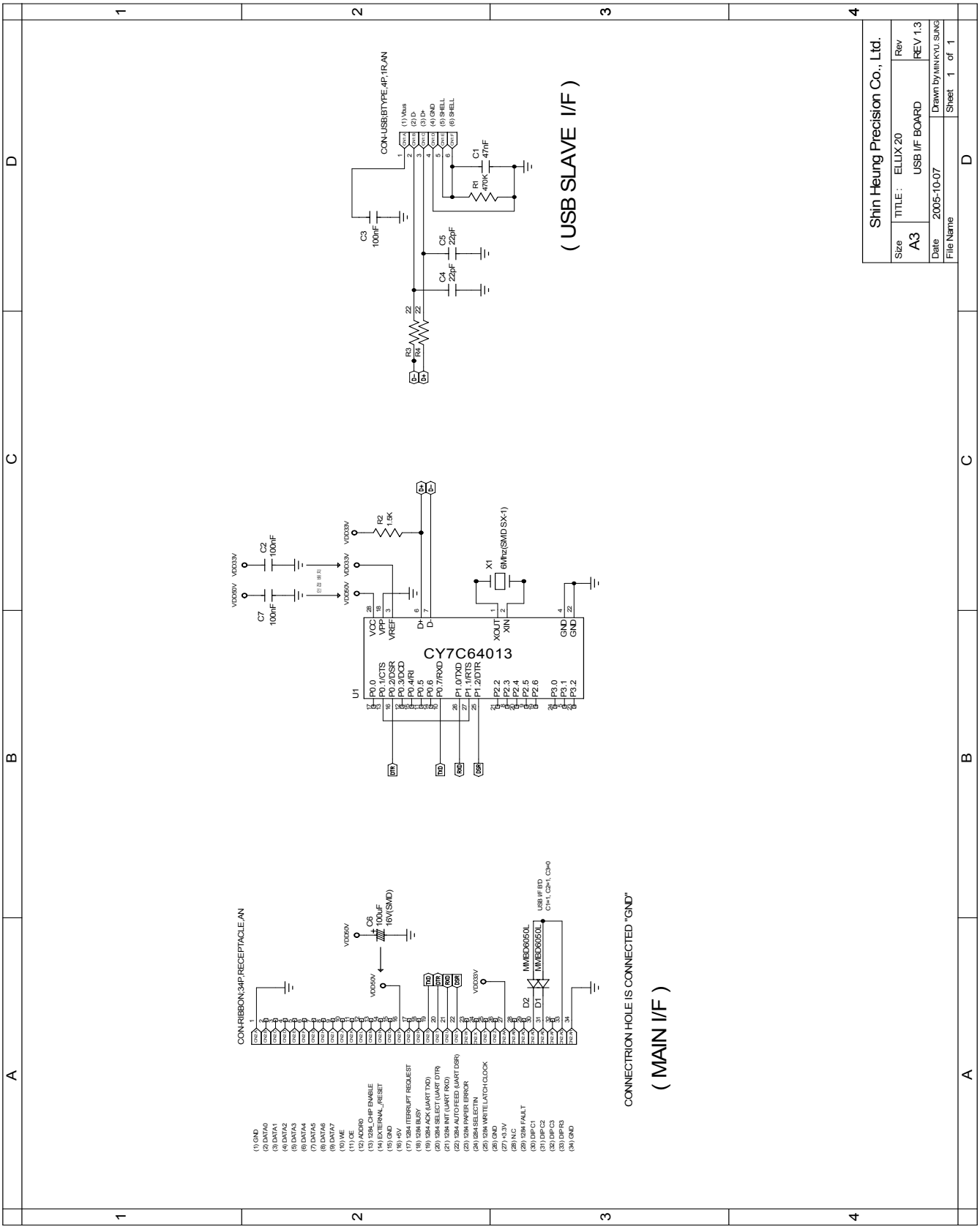
12.13 RS-485 I/F PCB Circuit



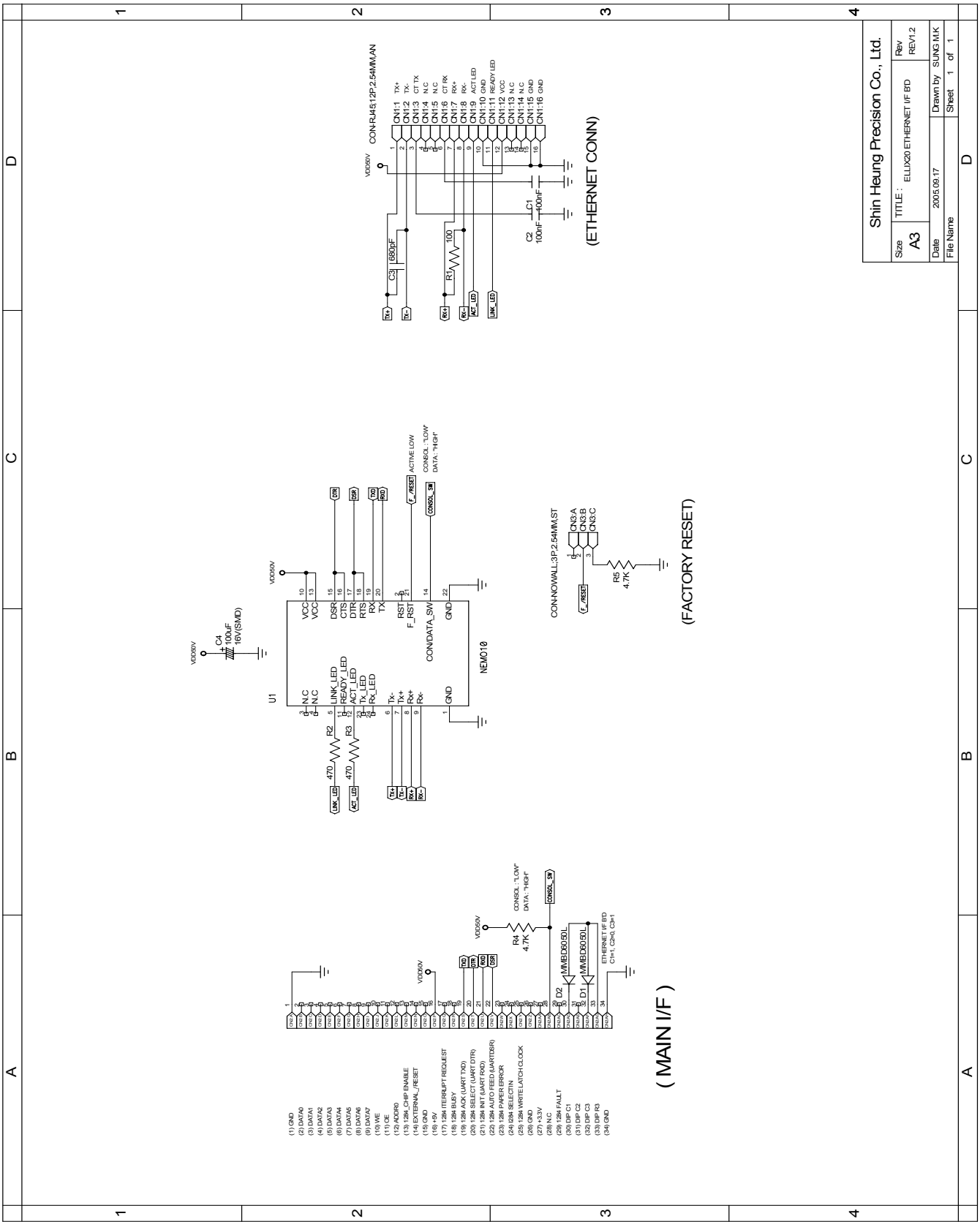
12.14 IEEE-1284 Parallel I/F PCB Circuit



12.15 USB I/F PCB Circuit



12.16 Ethernet I/F PCB Circuit



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Code No. : JK68-70107A